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CLINICAL MEDICINE

THE DIAGNOSIS OF INFANT DEVELOPMENT — *Arnold Gesell*

CLINICAL PROTEINOLOGY — *Co Tui*

TERRAMYCIN IN THE TREATMENT OF HUMAN BRUCELLOSIS — *M. Ruiz Castaneda and G. Guerrero Ibarra*

PSYCHOPATHOLOGY FOR THE GENERAL PRACTITIONER

SYMPOSIUM ON INSULIN SHOCK THERAPY — *George N. Thompson, Clarence W. Olsen, and Jenevieve J. Newton*

MEDICAL HUMANITIES

PSYCHOLOGICAL MOTIFS IN THE WORKS OF THE NORWEGIAN SCULPTOR, GUSTAV VIGELAND — *Ingjald Nissen*

ATOMIC MEDICINE

ABSTRACTS OF CONFERENCE ON ELECTRONIC INSTRUMENTATION AND NUCLEONICS IN MEDICINE

ABSTRACTS

BOOK REVIEWS

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VOL. 165 NO. 3 • WHOLE NUMBER 2829 • MARCH 1952

INTERNATIONAL RECORD OF MEDICINE

CLINICAL MEDICINE

The Diagnosis of Infant Development. Its Implications for Pediatrics and Child Psychiatry 149
Arnold Gesell

Clinical Proteinology 154
Co Tui

Terramycin in the Treatment of Human Brucellosis 166
M. Ruiz Casteneda and G. Guerrero Ibarra

CLINICAL PSYCHOPATHOLOGY

Symposium on Insulin Shock Therapy 171
George N. Thompson, Clarence W. Olsen and Jenevieve J. Newton

MEDICAL HUMANITIES

Psychological Motifs in the Works of the Norwegian Sculptor, Gustave Vigeland 177
Injald Nissen

GENERAL PRACTICE CLINICS

Conference on Electronic Instrumentation and Nucleonics in Medicine

A Cobalt 60 Irradiator for Teletherapy 184
Scintillation Counting For Brain Tumor Localization 184
A Fluoroscopic Screen Intensifier for Medical Use 185
Television in Medicine and Biology 185
Wave Propagation in the Living Human Artery 186
A Mechanical Heart for Artificial Maintenance of the Circulation 186
Physical Response Requirements of Pressure Transducers for the Reproduction of Physiological Phenomena 187
Analysis of Viscous and Elastic Properties of the Respiratory System by Electric Circuit Theory and Electronic Measurement Technique 187

A Monitor of Physiological Variables for Anesthesia and Other Uses 188
The Application of Electrical and Acoustic Impedance Measuring Techniques to Problems of Diathermy 189
Physiologic Measurements of Interest to the Clinical Anesthesiologist 189
Instrumentation for the Electronic Control of Anesthesia 190

ABSTRACTS

Program for Intern Training for General Practice 191
The Effect of Procaine Penicillin G on Experimental Traumatic Shock Induced by Unilateral Tourniquets 191
Routine Bacteriologic Sensitivity Determinations in Antibiotic Treatment 192
The Psychological Management of Cancer Cases 192

BOOK REVIEWS

Penicillin Decade, 1911-1931, Sensitizations and Toxicities 195
International Society of Hematology Proceedings of the Third International Congress, Cambridge, England, August 1950 195
International Pharmacopoeia 195
Premature Infants. A Manual for Physicians 196
Diabetes Control 197
Antibiotic Therapy 197

Through The Menstrual Years of Life-
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The Diagnosis of Infant Development

ITS IMPLICATIONS FOR PEDIATRICS AND CHILD PSYCHIATRY

*Arnold Gesell, M.D.**

NEW HAVEN, CONN.

We live in a troubled age. But babies are still being born, and at an accelerated rate. In round numbers almost 4,000,000 will be born in the United States in the current year. Infants and children under fifteen years of age constitute the largest single population group in the country.

The fate that awaits many of these infants is not unclouded. United States Public Health Service reports that there are now at least 30,000,000 persons in the United States who require some form of mental hygiene attention. The breakdown in round numbers is as follows: 5,000,000 suffer from psychoneuroses; 2,500,000 have character and behavior disorders; 1,500,000 are mental defectives; 500,000 are epileptics; 20,000,000 or more have borderline or transient emotional disturbances.

The vastness of the problem represented by these statistics is staggering. It is estimated that only one out of twenty persons with psychoneuroses now receives psychiatric treatment. The total problem is so colossal as a sheer cultural task that we are obliged to consider it more fundamentally in terms of preventive medicine. The problem has concrete implications for pediatrics, for child psychiatry, and for the general practitioner.

If we use foresight, would we not have to begin to reckon more deliberately with the newborn infant? I do not wish to describe a medical Utopia, but shall venture a few suggestions which are workable and which would serve to conserve and to increase mental health.

No arbitrary distinction needs to be made between physical and mental health. Modern medicine is driven to a monistic approach which recognizes the interaction of body and mind.

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The infant comes by his mind as he comes by his body—*through processes of growth.* He develops as a unit. This premise yields three propositions: (1) development is the supreme function of the organism because it sums up all other underlying processes; (2) health from a dynamic standpoint must be defined as that condition which permits and promotes optimal development; (3) development, as well as disease, falls within the scope of clinical medicine. This last proposition leads to the subject of this paper.

How can this proposition be implemented in a manner which will protect mental as well as physical health? This can only be accomplished by bringing the total complex of infant development under periodic diagnosis.

The foundations for such diagnosis have been well laid in modern practice. The pediatrician, in particular, has recognized the importance of periodic check-ups during the first years of life when growth is most basic and most rapid.

Developmental status manifests itself in three major kinds of signs and symptoms: anatomic, physiologic, and behavioral. First and foremost, attention is given to the infant's nutrition. This is as it should be. His weight, height, girths, body proportions, somatotype, growth rate, tonus, metabolism, allergies, all furnish important anatomic and physiologic evidence of developmental status. The increasing refinement of biochemical and electrometric methods and micromeasurements is destined to refine further the somatic appraisals of growth conditions. Behavior, however, will always remain the most inclusive and sensitive indicator of developmental status. The infant's unitary action system reveals itself lawfully in patterns of behavior. His behavior characteristics and capacities infallibly indicate the maturity of his neuromotor equipment. Behavior expresses the achieved efficiency of his total organism.

To appraise behavior we need systematic methods of interview, observation, and diagnosis. We must employ standard techniques adapted to individual and age differences. The examination must be conducted formally with precision of purpose. We cannot rely on intuition and incidental observation. To be sure, the seasoned practitioner through long experience develops considerable familiarity with indices of maturity. He dangles the bell of his stethoscope before the child and notes how the child reacts with eyes and hands and mouth. Or he permits the infant to play with the tongue depressor. On the basis of such objective observation, the physician makes an automatic judgment of the approximate maturity of the child. Very often the judgment is correct, but the sources of error are extremely numerous. If the infant looks at all normal, the physician is tempted to say, "Give him time. He's all right. He will outgrow it!" The result is that many developmental defects and deviations escape early diagnosis and parents do not get the type of help to which they are entitled.

Whether the child is handicapped or not, parents constantly seek assurance with respect to his physical growth and ask questions for guidance as to proper methods of everyday care. Parents are also increasingly concerned about the child's total development, which includes his mental health.

Should not clinical medicine contrive to meet these demands which are becoming more articulate? Pediatricians are showing the way both in private practice and in community service through well baby conferences. The periodic supervision of a baby's development begins with nutrition, but it does not always end there. To realize a more complete health service, it is necessary to take into account the total economy of the

child's organism including his behavior characteristics and his general functional maturity.

Even the busy general practitioner can make a behavior inventory from time to time as a minimum check and as a screening device for detecting abnormalities. Such an inventory can also be used as a point of departure for guidance in the field of parent-child relationships.

In contrast to the behavior inventory, a diagnostic developmental examination of infant behavior is a standardized procedure with a well defined technique. The procedure requires special training and clinical skill based on ample experience with normal, deviant, and defective infants. The principles and methods of developmental diagnosis are described elsewhere in detail.*

In the method evolved at the Yale Clinic, we use an ordinary hospital crib with adjustable side panels supporting a table top on which simple test objects are placed to elicit characteristic patterns of behavior, patterns which are symptomatic of the maturity and the organization of the infant's nervous system. For example, one of our test objects is a red, one inch cube. The newborn infant is so immature that he cannot perceive the cube, but he does clasp it with a reflex grasp when it is pressed into his palm. At sixteen weeks, when the infant is held in a supported sitting position, he perceives a nearby cube and fixates his eyes upon it. His nervous system is growing at a prodigious rate. At twenty-four weeks he can coordinate eyes and hands; he seizes a cube on sight. It is a crude palmar grasp. At twenty-eight weeks the radial digits come more prominently into play. New behavior patterns are taking shape as the nervous system undergoes its progressive organization. Having seized a cube, he can transfer it from one hand to the other. At forty weeks he grasps the cube deftly by thumb opposition. At twelve months he can release the cube on intent. At eighteen months he builds a vertical tower of three cubes, at two years he builds a horizontal wall of three cubes, at three years a bridge of three cubes, and at five years he builds a staircase of six cubes.

These are lawful sequences of growth, only secondarily influenced by cultural factors. They are so fundamentally determined by intrinsic growth factors that they may be used as criteria for appraising the maturity and integrity of the nervous system. All psychologic development, even in the sphere of intelligence and emotions, is subject to similar maturity sequences. These growth sequences and these patterns of behavior are identified and appraised through the method of *developmental diagnosis.*

The method is based upon a systematic investigation of the behavior growth of a large group of normal infants whose development was followed at periodic intervals from birth through the first five years. The infants were examined under controlled but home-like conditions, with full cooperation of the parents. Great care was taken to secure natural and optimal behavior. Extensive cinema records were made at lunar month intervals during the first year of life and at lengthening intervals later. These records were subjected to minute inspection and analyzed as so many anatomic cross sections of behavior patterns. The home behavior of the infants also was explored. On the basis of these

* Gesell, A. and Amatruda, C.S. *Developmental Diagnosis: Normal and Abnormal Child Development.* New York. Hoeber, 1947. Revised second edition, Pp. xvi, 496.

periodic observations, it was possible to define the behavior characteristics typical of a series of advancing age levels from birth through five years of age.

Four major fields of behavior are embodied in these norms of development as follows:

Motor behavior: Posture and locomotion; prehension and manipulation; gross and fine motor coordination.

Adaptive behavior: Self-initiated and induced behavior; learning; resourcefulness in adjusting to new situations; exploitive behavior.

Language behavior: Vocalizations; vocal signs; words; gestures; comprehension.

Personal-social behavior: Reactions to persons; response to gesture and speech; socialized learning; habits of self help.

Typical or *normative* behavior traits are codified in the form of developmental schedules, embracing the first five years of life.

Although a behavior inventory does not constitute a developmental examination and can never take the place of such an examination, it can serve useful purposes. Periodically undertaken by the supervising physician, it becomes a valuable part of the history record of the child, particularly if untoward developments occur in later life. In child care institutions and also in children's hospitals, a routine periodic check serves to keep the clinical problems of development in focus. Even under apparently favorable conditions it is possible to neglect an institutional child if the pattern of his development is not kept in mind.

The developmental welfare of the child is, however, better protected if at selected age levels his growth status is systematically appraised by a pediatric examination which includes a developmental examination of behavior and an inquiry into parent-child relationships. This type of developmental appraisal is essential to a preventive and supervisory policy of mental health protection.

The developmental examination of infant behavior accomplishes five results:

1. It ascertains stages and degrees of maturity.
2. It leads to early differential diagnosis of normality, defect, and deviation.
3. It reveals neurologic defects and sensory handicaps not disclosed by ordinary methods of clinical examination.
4. It supplies important objective information concerning the organization of personality.
5. Periodic examinations make possible a constructive type of developmental supervision which takes mental health into account.

We need not assume that every pediatrician will suddenly become an expert in developmental diagnosis. Neither can we assume that the vast task of mental hygiene can be conveniently referred to child psychiatrists who are mainly concerned with frank behavior disorders and psychopathologies.

A comprehensive program of mental hygiene will naturally have to rest on a basis of pediatric and general medicine. The child's doctor, whether specialist or generalist, has the primary medical responsibility. Even before the child is born, he can collaborate

with a cooperative obstetrician and anticipate that part of maternal hygiene which is preparatory to parenthood. The psychologic orientation of the mother (and indeed also the father) to the problems of the neonatal period can be foreseen by suggestive guidance in the prenatal period.

Well placed periodic developmental appraisals during the first years of life are indicated for relatively normal children as well as for those who are not developing satisfactorily. By extending the concept of developmental supervision to all infants, we shall be in a better position to individualize child care and to attain the goals of a preventive mental hygiene.

Should not this concept of development become part of the professional training of all physicians dealing with children? Some induction and preclinical indoctrination may be accomplished during the basic medical courses. But at the postgraduate level we need a teaching center set-up functioning in close relation with a specialized diagnostic unit, the unit to be equipped for developmental diagnosis and for the demonstration of normal infants as well as more unusual cases.

The intern and resident should be systematically and concretely exposed to a clinical science of Child Development. Such a science deals with the nature and norms of the developmental process in embryo, fetus, neonate, infant and child. It is basically concerned with the laws and manifestations of healthy normal development. It employs the criteria of normality to interpret all forms of maldevelopment—mild, moderate, and grave. By concentrating upon the normal potentials of growth and the residuals of normal manifestations in defective children, the techniques of developmental diagnosis can make a positive contribution to the hygiene of mind and personality.

The clinician regards the developmental behavior examination as a life situation for the child and parent. He takes into account the total circumstances, and appraises the behavior reactions and adjustments to these circumstances. This life situation technique makes possible a supervisory type of infant psychiatry oriented to developmental pediatrics, and based on a clinical science of normal child development.

A developmental approach is equally applicable to normal and handicapped children. All children are confronted with the problem of achieving optimal development. All need our help—the normal child born in a fortunate home, the child born out of wedlock, the child reared in a home broken by divorce or some other disaster, the child damaged by cerebral injury, the primary and secondary ament, the blind and near blind, the deaf child, the child with a convulsive disorder, the unstable child. In all these instances, the potentials of development are of most concern to family and society. From the standpoint of preventive and constructive medicine, every child is entitled to some degree of developmental supervision and guidance based upon developmental diagnosis.

Clinical Proteinology

*Co Tui, M.D.**

NEW YORK, N. Y.

Dr. McLester has recently made the statement that the recognition that nutrition is often the determining factor in recovery from disease has been slow in arriving.[1] This may be paraphrased in two ways: 1. that the clinician has been slow in applying in his practice the knowledge of nutrition, or 2. that the nutritionist has not enlisted the aid of the clinician in extending nutritional studies into the clinic.

From the wisdom of hindsight, it can be said that both nutritionist and clinician have been culpable, with the result that the patient has been for too long a time deprived of the aid that nutrition could have given him in combating disease and expediting convalescence. While this statement is true of nutrition in general, it is true of protein nutrition in particular.

There are two conditions in which the field of nutrition and the clinic overlap. There are the primary deficiency diseases—those in which the absence or inadequacy of one or more food factors brings about a disturbance in health—such as the avitaminoses and simple starvation. Then, there are the deficiency conditions caused by disease and termed by Jolliffe[2] the "conditioned deficiencies," which, in turn, add to the havoc wrought by the primary disease process. It is conditioned protein deficiency with which this paper will deal.

THE IMPORTANCE OF PROTEIN

The importance of proteins in the body derives from the facts that (a) it is second only to water in abundancy as a body constituent, (b) it is inextricably involved in the maintenance of the integrity of the fluid compartments of the body as well as of its tissues, (c) it forms the matrix of the cells, cytoplasm as well as nucleus, (d) it plays an important role in such important life processes as the warding off of bacterial invasions, (e) it enters into the composition of the enzymes and hormones without which life is impossible, and (f) in disease the loss of proteins from the body in biological fluids in the form of nitrogeneous products and particularly in the markedly increased azoturia may be so great that, in combination with a concomitant restricted dietary intake, a severe protein deficiency may intervene.

Terminology: The terms *undernutrition, emaciation, cachexia, protein malnutrition, protein deficiency and protein depletion* have been used interchangeably in the literature to denote a lowering of the protein status of the body. *Hypoproteinosis*[3a,3b] and *hypoproteinism*[4] have recently appeared.

In the interest of a consistent terminology the author[5] has proposed the terms *normoproteinia* and *hypoproteinia* to denote respectively normal and subnormal protein status of the body. For the condition in which a sub-normal level of proteins in the blood exists, the term *hypoproteinemia* is retained, while the term *normoproteinemia* may,

* Director of Biologic Research, the Creedmoor Institute for Psychobiologic Studies, and The van Ophuijsen Center.

according to this terminology, be used to denote a normal level of blood proteins. Such a practice is consistent with the use of such terms as *hypoxia* and *anoxia* in physiology to denote systemic levels of oxygen as distinguished from blood levels. It is gratifying to note that Dr. Youmans has used the term *hypoproteinia*.[6]

PHENOMENOLOGY

The symptoms of hypoproteinia have been dealt with extensively by Keys et al.[7] We shall, therefore, only recapitulate the principal ones. Loss of weight is a cardinal symptom, with loss of strength, (asthenia) and disinclination to effort, and, in more prolonged cases, anemia and pallor. In more severe cases, there are definite mental changes, anorexia, loss of body girths, shrinkage of organs, first latent and then manifest edema, fear of cold, low basal metabolism and loss of sexual desire. How early the impairment of wound healing and hypoproteinia supervene has not been determined.

The havoc which can be brought about by hypoproteinia on the body has been implied in the section on the importance of proteins. The present basic knowledge on hypoproteinia has been derived from planned experiments on human starvation and from observations made on cases of starvation before, during and after World War I. It has been greatly enriched and clarified by the work of Keys, etc., of the Minnesota project during World War II. However, the date on the physiologic and biochemical disturbances attempted in this Minnesota study by their very nature can be made only up to a certain point and no further.

The voluntary experiment, however heroically designed, cannot be carried out to the point of endangering the subject and, therefore, the hypoproteinia thus produced cannot be expected to reach the severe grades frequently encountered in actual starvation or in disease. Thus the monumental data of the Minnesota project must be evaluated with the understanding that these phenomena occurred in the course of hypoproteinia which involved approximately a 25 per cent loss of body weight. Nor under the experimental circumstances can the interplay between hypoproteinia and disease be observed.

For knowledge of deeper grades of hypoproteinia, dependence must be laid upon observations made on cases of starvation, such as were made by Mollison at Belsen concentration camp,[8] or by Walters et al on Indian prisoners of war held by the Japanese,[9] by Burger, Drummond and Sandstead in Western Holland[10]; or on the hypoproteinia produced in association with disease as have been reported by Lyons[11] and by Co Tui.[5] Chortis[12] has contributed valuable material on the interaction of hypoproteinia and pulmonary tuberculosis. However, neither starvation nor disease offers the ideal study conditions offered by the planned study and the observations must all be qualified, either by environmental difficulties or by the effects of disease.

Recent studies on the effect of the protein status on endocrinology are both promising and fascinating. Of particular interest is the work of adequate protein intake on ACTH production.[13a,13b] In turn, the role of ACTH on the renal excretion of a pressor substance links protein metabolism with the study[14a-d] of hypertension in a sense which would not be expected from the implications of the Kempner rice diet. Millman's study[15] of the effect of hypoproteinia on enzyme contents is a welcome beginning in the understanding of the relation between enzymology and protein nutrition.

The increasing realization of the interplay of disease and the protein nutriture and of the beneficial effects of supporting protein nutriture in disease is due in part to the combination of general clinical observations of such pioneers as McLester and Youmans and in part to the more specific work of various investigators. Slowly and surely the importance of the protein factors in the management of disease has grown to such an extent that McLester[16] has ventured to call the present age of nutrition the "protein era."

It will be the aim of this paper:

(1) to recapitulate briefly the historical steps of development of clinical proteinology in the principal specialties,

(2) to discuss some misconceptions and unsettled points and

(3) to bring out some practical considerations in clinical protein nutrition.

HISTORICAL DEVELOPMENT

Surgery. Although the surgeon, in contrast with the internist, carries on a more urgent responsibility by virtue of having to add the stress of therapeutic trauma to the stress of disease, the role of proteins in surgery had received no investigative attention until Carrel and Hartman,[17] Clarke,[18] and Howes and Harvey[19] studied their effects on wound healing. However, genuine interest in the protein factor in the clinic may be dated to the work of Cuthbertson[20] on the protein loss in fractures and to that of Thompson and Ravdin[21] on the occurrence of hypoproteinemia in patients with non-healing wounds. In relatively rapid succession came the introduction of intravenous use of protein hydrolysates by Shohl *et al*[22] and subsequently by Elman *et al*[23] and the succession of reports by Co Tui and his group on protein loss and the effect of hyperproteinization in gastric surgery,[24] in decubitus ulcers,[25] and in burns.[26]

Of cardinal value to clinical proteinology are the findings of the Co Tui group[4, 23, 24, and 25] subsequently supported by the results of other workers that:

(1) The hypoproteinic subject is able to deposit nitrogen far in excess of what had been thought possible in contemporary literature.

(2) The level of protein intake for the hypoproteinic patient must be from 250-500 Gm.—daily—that is the level for replenishment optimum approximates or even exceeds that for optimum growth, and

(3) The large deposition of nitrogen is associated with acceleration of rehabilitation and convalescence.

(4) The catabolic or antianabolic period following injury can be eliminated by increasing the level of intake.

These four points furnish most of the scaffolding on which clinical proteinology is built.

A flood of papers have since appeared, all helping to win a place in the surgical armamentarium for the protein factor. More acceptable protein and calorigenic preparations have been made increasingly available for nutritional support of the patient, preoperatively in the course of disease, postoperatively and throughout convalescence.

Internal Medicine. In this field, there is not as general awareness of the protein perhaps

because the protein loss is slower and more insidious and because the traditional association between loss of weight and asthenia in disease has never been dissociated in the mind of the physician. This lack of awareness of protein needs exists in spite of the fact that Farr[27] as early as 1938 has shown the importance of loss of high protein intake in nephrosis.

Although the favorable results obtained in the protein hydrolysate treatment of peptic ulcers have been attributed by other authors to improved protein nutrition, our studies suggest that there are perhaps two factors in play.[28]

In the acute stage of treatment, the pharmacologic effect of hyperaminoacidemia occasioned by the feeding of protein hydrolysates and the antacid effects are perhaps the important factors, while in the subacute stage of treatment, the nutritional factor contributed by the greater availability of protein products accelerates the healing of the ulcer. It is perhaps this dual effect that explains the noneffectiveness of strained beef alone or in combination with antacids in the acute stage of the ulcer disease.[29]

McLester has mentioned typhoid fever as a disease in which the outcome has been favorably influenced by nutritional support.[1] The anemia and hypoproteinemia found by Armstrong *et al*[30] complicating severe and protracted cases of pneumonia perhaps indicate a disturbed protein metabolism. A great deal of valuable and practical knowledge can be gained from the study of protein metabolism in diseases due to infectious agents, although the use of antibiotics and chemotherapeutic agents, by shortening the course of many infectious diseases, has made such a study less imperative.

In the infectious diseases in which no effective antibiotic agents have been found, such a study is still urgently indicated. An example of this is the work of Boines[31] on the use of hyperproteinization in minimizing the ravages of the disease and in accelerating rehabilitation in 77 cases of poliomyelitis. Boines results have been supported by Peterson[32] and Boynton.[33] The rationale impelling Boines to the use of hyperproteinization (in conjunction with an exercise program made possible in the rigid muscles by curarization) was to supply the body with adequate proteins to permit the rebuilding of muscles stimulated by the exercise program. The promising results of this work indicates a systematic quantitative metabolic investigation.

Tuberculosis is one disease in which the protein factor was once heavily stressed but is at present underemphasized. The probable reason for this will be discussed in a later section of this paper.

In the field of degenerative diseases may be mentioned the work of cirrhosis of the liver in which Ravdin *et al*[34] Vars and Guard[35] and Morrison[36] showed that high protein intake permitted the regeneration of liver cells. However, the investigation of the protein metabolism in degenerative diseases has scarcely begun.

Pediatrics. This is one specialty in which the protein needs of the body were recognized earlier, even than in surgery. As early as 1921, Holt and Fales[37] concluded that in the first year of life, children should receive 4 Gm. of protein per Kg. per day. Daniels *et al*[38] in 1935 found that children from 3 - 5 years stored protein at a maximum rate when given 3.2 Gm. of protein per Kg., and Hawks[39] *et al* found that children more than 3 years old did likewise when given 3 to 4 Gm. of protein per Kg. It was in fact in pediatrics[20] that the protein hydrolysate was first used. Lynch[28] has

recently called attention to "hypoproteinosis" in children and to the necessity for its correction.

Other Specialtis. The role of proteins in skin conditions is now receiving attention, particularly in the exudative and exfoliative conditions. In scleroderma, Co Tui *et al*[40] have shown that hyperproteinization produces a significant softening of the sclerosed tissues.

SOME MISCONCEPTIONS AND UNSETTLED POINTS

Nitrogen Equilibrium. One of the most basic misconceptions is that of the significance of the nitrogen equilibrium. The attainment of this equilibrium has been interpreted by some authors as signifying normoproteinia, i.e. a normal protein status, and the minimum of protein requirements for nitrogen balance has been equated with the protein requirements of the body. This identification may be justified in the normal individual where only maintenance is required but becomes pernicious when applied to the ill. As the body is deprived of adequate protein intake, its protein and caloric needs are correspondingly reduced— as reflected in the decreasing azoturia. This has been shown in the professional starvers, Levanzin[41] and Succi,[42] and recently confirmed in the dog by Allison.[43,44] With each day's loss of protein from the body and further reduction of tissue mass, a lower and lower protein and caloric intake is required to attain equilibrium, so that an equilibrium reached at such a low plane of intake is more an indication of hypoproteinia than of normoproteinia. In fact, the ease of attaining equilibrium has been used as a means of detecting hypoproteinia.[45]

How this misconception may affect clinical practice is illustrated in the shift of attitude in the dietetic regimen in pulmonary tuberculosis. Some three decades ago, a rich diet of eggs, milk and meats, i.e. a high protein diet, was advised as an important measure in the treatment of tuberculosis. However, in 1926, there appeared a report[45] showing that it took no higher protein intake to achieve equilibrium in cases of tuberculosis than in normal persons. This has been interpreted to mean that the protein needs of the tuberculous were no higher than the needs of the normal person. An intake of 90 Gm. of proteins a day was accordingly recommended with the warning that a higher intake might prove deleterious by provoking increased respiratory activity (because of the specific dynamic action of proteins).

Accordingly, in the most recent authoritative tests on tuberculosis, rich protein feeding is scarcely mentioned while the possible deleterious effect of increased specific dynamic action has been stressed.[46,47] While it may well be true that the maintenance of good protein nutrition is not the only therapeutic measure in tuberculosis, the neglect of this factor—to which such an unbalanced attitude could be conducive—is well attested to by the studies of Chortis[12] of the much more rapidly fatal outcome of hypoproteinic tuberculous patients.

That Normoproteinemia denotes Normoproteina. One often reads in the literature the statement that, because the plasma or serum proteins are at the normal level, the patient cannot be suffering from protein deficiency. However, the work of Keys *et al*[7] on the volunteer starvers of the Minnesota project have refuted this conclusively. These authors showed that even with a loss of 25 per cent of body weight after 24 weeks

of semi starvation, and with the symptoms of hypoproteinia in the forms of reduced organ size, of alterations in the fluid compartments and in tissue permeability, and of mental changes, the plasma proteins still remained within the range of normal. Thus, while a low plasma protein level may reflect hypoproteinia, the reverse does not hold true, at least above the level of 25 per cent of body weight loss.

Lack of a grading method for hypoproteinia. The failure of the yardstick of hypoproteinemia in grading hypoproteinia mentioned above disposes of the only ready clinical method available. It is quite possible that a better understanding of the changes of the fluid compartments of the body in hypoproteinia and of the increased permeability of hypoproteinic tissues will furnish us with a reliable yardstick in the future. At present, the clinician must still depend upon gross change in body weight. The ease of achieving nitrogen equilibrium is another possible yardstick, but as Ravdin has pointed out, it is clinically unwieldy.[48] This lack of a reliable grading method leaves proteinology in a confused state, for we still do not know at what state of depletion the various phenomena associated with the syndrome occur, particularly the important factor of impairment of wound healing.

The Catabolic or Antianabolic Period. One of the main drawbacks to the use of a hyperproteinization regimen in the course of disease is the so-called catabolic period immediately following injury or during the course of disease. During this period, there is an azoturia of such an extent as to cause a negative nitrogen balance. This increased outpouring of nitrogenous substance has been attributed to an endocrine factor—associated with the "alarm reaction" of Selye[49,50] and supposedly an over-excretion of adrenocortical hormone or hormones. In the light of the newer knowledge of the hormones of the adrenal cortex, this factor could well be the protein catabolic or glucocorticoid hormones, cortisone or compound F.

This catabolic effect has been thought by various workers to be irreversible[51-54] so that all the protein intake given during this period would presumably be used not for anabolism but for energy purposes. Co Tui[55] has, however, shown that, by the use of a requite high level of protein feeding, positive nitrogen balance can be achieved throughout the entire postoperative period in gastrectomy, cholecystectomy, herniotomy, and appendectomy. Werner *et al*[56] have confirmed these findings in cases not only of gastrectomy but also of fractures of long bones, the very condition in which Howard has found the prolonged catabolic phenomenon. While the Werner group[57] is inclined to doubt the presence of an endocrine factor, the work to date on the secretion of ACTH and Cortisone in stress leaves little doubt that hormones play a significant role. Co Tui, on the basis of his studies,[55] holds that, if such a catabolic factor is present, its effect can be counter-balanced by increasing the level of protein intake.

This clinical finding has been confirmed experimentally by Engel *et al* in a series of papers[58-61] showing that the protein catabolic response to either adrenal hormone or stress in the fasted animal can be abolished by administration of carbohydrate or amino acids. Co Tui[55] has even hypothecated that each disease entity has its own specific range of protein catabolism and, therefore, would require its own specific range of protein and caloric intake to maintain the protein status.

A recent experiment of Madden[62] appears to dispose of this hitherto moot point

of irreversible catabolism. He gave a mixture of amino acids containing radioactive methionine intravenously to experimental animals with the acute injury of a turpentive abscess and found that under these conditions radioactive sulfur in comparable amounts was found in the tissues both of the experimental animals and controls. As an editorial in a recent issue of the J.A.M.A. expressed it, "There seems little or no support for the idea that amino acids after injury are useless in protein nutrition and that, if given, they merely act as a source of energy. . . Food is an important requirement under most, if not all conditions, and protein seems no exception to this rule."[63]

PRACTICAL CONSIDERATIONS

A good working knowledge of both caloric and protein needs is required by the physician in order to give his patients the best possible nutritional management. This requires a habit of quantitative thinking, which the average clinician has still to develop.

Caloric Adequacy. It is to be remembered that the maintenance of the basic energy requirements is an order of high priority in the physiology of the body. When not supplied with enough calories to meet this need, the body will burn not only exogenous proteins but also the proteins in body tissues. Only a simple knowledge of arithmetic is required—the conversion factor of pounds into kilograms (No. of lbs/2.2). The caloric needs are arrived at by multiplying the number of kilos of body weight by the per Kg. caloric need. Riegel and his group[64] believe, on the basis of experimental work, that at least 30 calories per Kg. must be given in the form of carbohydrates. Rose,[65] in his experiments on the amino acid requirements of man, has found that at least 45 calories are required. In our own work on severely hypoproteinic patients,[5] we have used with satisfactory, if not necessarily optimum, results an overall amount of 50 calories per Kg.

Protein Requirements. In the efficient management of the protein nutriture of a patient, it is necessary not only to take into account the present picture, but also to forecast the future picture as it is likely to evolve under the catabolic influence of disease. Since neither the assay of the nutritional status nor the protein loss in the course of the various diseases has been the subject of a systematic study, these pictures must at present be conjectured. There are, however, some rough but useful indices which the physician has used empirically. Thus, if the body weight is not markedly under par, if the skin texture and coloration is good and there is no asthenia, and if the blood count and plasma proteins are within normal ranges, such a patient may be expected to withstand illness, injury, or an operation of a moderate severity without grossly compromising the process of recovery.

There are, however, cases in such critical nutriture that the nutritional management becomes a matter of urgent or even emergent concern. These are cases who have lost a great deal of body weight—roughly over 25 per cent with or without clinical edema, hypoproteinemia and anemia. If such cases are subjected to trauma, accidental or surgical healing and recovery may be impossible and a vicious cycle of further hypoproteinia may supervene as a result of further loss of body proteins in azoturia, in exudates, or in the increased flow of other body fluids.

In the rehabilitation of the severely hypoproteinic, it is necessary to get away from the straightjacket of the levels of intake recommended by the National Research

Council.[66] The object is to give as large a quantity of easily absorbable and high quality proteins and calories as soon as possible. The use of inadequate proteins, such as gelatine, at this stage is also a mistake since it takes up a part of the precious gastric space which should be used for superior nutrients. The response to the so-called "high protein diet" of 120 Gm. of protein daily is slow, as shown in Keys' Minnesota project.[67] Even on an intake of 130 Gm. daily, the rehabilitation was a slow process, showing none of the rapid gain in weight strength and morale of the cases reported by Burger, Drummon and Sandstead[10] and by Co Tui[5] with protein intakes of 3-4 times that level.*

Such levels are now being administered by Levinson[68] and by Blocker[69] in severe cases of burns and recommended by Pollack and Halpern[4] in the severely hypoproteinic. Attention may be called to the fact that this hyperproteinization level for repletion approximates and even exceeds the optimum level for growth in children as found by Holt, *et al*, Daniels *et al* and Hawks, *et al*.

In the severely hypoproteinic, proteins and calories must be administered in the most absorbable form and without roughage in order to permit maximum use of the gastric capacity. Protein concentrates or protein hydrolysates and the simpler sugars are easier to administer than food prepared in the kitchen. In those patients for whom even the effort of swallowing is a strain, the food should be prepared in drinkable form.

Feedings should be given as frequently as the patients can be prevailed upon to take them, every hour, if possible. Tube feeding may be necessary. Blocker[69] has in fact developed a pump which keeps a constant stream of nutrients supplied to the gastrointestinal tract, making it possible to administer amounts of protein as high as 500 Gm. daily provided ambulation is practised. After the first 24 to 48 hours of hyperproteinization, there is usually a dramatic change as have been reported above. The change consists of a brightening of the affect of the patient, a return of strength, less fear of cold and greater inclination to effort, and a return of appetite. Burger, Drummond and Sandstead's[10] description of this dramatic change may be quoted "Recovery from a depressed and apathetic state, oedema and adyamia disappearing and they could be mobilized more quickly." There may be an initial loss of weight, a phenomenon explained by Co Tui[5] on the basis that the loss of body fluids is faster than the gain in tissue proteins. Where indolent wounds are present, the pale, edematous and poorly vascularized and soft granulation tissue is replaced by firm, better vascularized pink granulations. X-ray studies of the gastro-intestinal tract will reveal that a pre-existing hypotonia and hypomotility have disappeared.

After the first 3 or 4 days of this acute stage, the switch may be made to kitchen-prepared food, cooked for easy digestion. Even at this stage, gastric capacity is still too precious to waste on foods of large roughage, or on such inadequate proteins as gelatine. The kitchen-prepared food is used as a scaffolding for the over-all dietetic program and a symbol of the patient's return to normal, but in fact most of the protein intake must still be supplied by supplementary feeding with native proteins, preferably in minute particulate form such as are found in "strained beef" or in milk proteins. This small size, according to Co Tui,[5] exposes the proteins effectively to the digestive enzymes and insures rapid absorption and the maintenance of a high nutrient amino acid potential in the gut

* In famine relief this level of intake may not prove practicable.

which forces a higher nutrient potential in the blood and, in turn, ultimately a higher protein deposition in the tissues.

Finally there are the cases in good, present, protein nutriture who are to be subjected to severely traumatic operations or who are in the early and debilitating stages of a prolonged illness. In the postoperative period, or during the acute stage of disease, food ingestion may be severely restricted for one reason or another, and this, with the increased azoturia and increased loss of other biological fluids, may usher in hypoproteinia which may retard recovery. Intravenous feeding may become imperative. Elman first introduced intravenous alimentation with protein hydrolysates with the idea of mitigating, not correcting, protein loss. Two of the initial difficulties of intravenous feeding were the problem of not giving enough protein and caloric intake, and the danger of giving too much salt. However, the development of salt low hydrolysates and the higher concentration of both hydrolysates and dextrose are partially successful in combating these difficulties. Shafiroff's use of intravenous fat emulsions[20] may eliminate the problem of adequacy of intravenous caloric administration.

In this group too, main reliance must be placed not on the protein intake served in the kitchen-prepared meals but on supplementary feedings. In cases requiring massive protein intake, as in burns, pump tube feeding can be combined with oral ingestion, as practiced by Blocker.

The efficient fulfillment of the nutritional program thus outlined would seem to depend more on the physician-nursing team than the dietetic force. It is the physician who can better assay the nutritional status, and quantitatively prescribe the actual caloric protein and vitamin needs of the patient as well as the mode of administration indicated. It is this team who are in a position to keep a spot-check record of the intake and the response of the patients, and from this information maintain the required intake of the patient. In this calculation of the daily intake, the data from the supplemenary feedings of homogenous preparations will be more precise than the record of the kitchen-prepared food.

In our earlier work most of the cases of hyperproteinization in convalescence was effected with protein hydrolysates. This was in part because of the greater availability of hydrolysates, and in part because of the more uniform composition and greater ease of preparation, both of which facilitate quantitative studies. In subsequent work, when ready-prepared, natural protein concentrates, such as milk proteins and strained beef, were more readily available, it was possible to compare their respective advantages and disadvantages, and to demarcate fields in which one or the other can be used to greater advantage.

Our present conviction is that, while protein hydrolysates are useful in tube feeding cases and in the treatment of peptic ulcers for reasons other than nutritional, most of the protein intake for the rehabilitation of the hypoproteinic must be provided in the supplementary feedings with finely divided native proteins.

It is understood in the administration of proteins that vitamins, minerals, and fluids are provided in full quota.

SUMMARY

In this short review of clinical proteinology, it has been the authors attempt to set forth:

1. The importance of proteins to the body in health and disease.
2. A short review of the historical development of proteinology in the different specialties has been traced. Four cardinal points have been pointed out.
   (a) The hypoproteinic subject is able to deposit nitrogen far in excess of what had been thought possible in contemporary literature.
   (b) The large deposition of nitrogen is associated with acceleration rehabilitation and convalescence.
   (c) The level of protein intake must be 150-500 Gm. daily, depending upon the protein needs of the body at that particular stage in the course of disease.
   (d) The catabolic or antianabolic period following injury can be reversed by increasing the level of intake.
3. The phenomenology of hypoproteinia.
4. The clarification of some misconceptions and unsettled points—namely 1) the misinterpretation that the level of protein intake required to attain nitrogen equilibrium is not identical with the protein requirements of the body, 2) that normoproteinemia necessarily denotes normoproteinia.
5. Practical considerations in the application of proteinology in the clinic.

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Terramycin in the Treatment of Human Brucellosis

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Brucellosis continues to be a difficult therapeutic problem in spite of the undoubted usefulness of aureomycin, chloramphenicol, and the more recently discovered antibiotic, terramycin. In a report to the III Inter-American Congress of Brucellosis,[1] the results of a comparative study of the therapeutic value of the above-mentioned drugs and also the results of the use of the combination of streptomycin and sulfadiazine were presented. According to these observations, terramycin is comparable, in the results of treatment, to aureomycin. The patients were treated with moderate doses of terramycin for a period of 10 or 15 days, then dismissed, but observed for a prolonged period of time. From those patients who were kept under observation for at least 12 months, a group of 28 cases was available for evaluation. These formed the basis for the above-mentioned report.

Since the presentation of our first report, we have gathered additional data. Prior or contemporary to our studies, other reports, however, have appeared.[2-5] Likewise, others have contributed data on the effect of the drug against the experimental infection. Since our first report, thanks to the cooperation of the investigators of Pfizer & Co., Inc., we have been able to increase our experience on the use of terramycin and to determine, to a certain degree, the minimum effective dose which brings about satisfactory therapeutic results.

It may be of interest to indicate that the cases selected for the present report are those in which the diagnosis was based on the isolation of brucella organisms from the blood. Most cases, therefore, may be considered according to the usual terminology: acute or subacute, even if some of the latter had been ill for nearly a year. Typical chronic cases with negative blood cultures were not considered suitable for antibiotic therapy. A number of cases, in which it was not possible to maintain a survey for at least two months, are not included in the present report.

The type of infection was *melitensis* in all cases, as proved by identification of the infecting agent.

The patients were classified according to the duration of the disease, from onset to the beginning of treatment. Factors, such as sex or age, did not appear to be of importance. In regard to the clinical aspect of these patients, little can be said except that most cases presented a febrile reaction of varied severity, accompanied by muscular or articular pains, persistent sweating, and considerable physical and mental depression. Cases with complications due to special localization of organisms were not common. In this respect our observations have shown that brucellosis produced by *Br. melitensis*

is more likely to occur as a generalized infection of the typhoid type with less tendency to produce local tissue destruction than seems to be the case in *abortus* or *suis* infections.

The cases treated have been grouped as follows:

1. Twenty-eight cases treated with daily doses of 2 Gm. of terramycin for 10 days, followed by additional treatment for 5 days after a rest period of 5 days (Table I).
2. Twelve patients treated by 3 to 5 series of 5 days each, with 2 Gm. daily, interspaced by rest periods of 5 days (Table II).
3. Forty-four cases treated by series of 3 to 4 days with doses of 0.75 Gm. a day of oral terramycin, interspaced by rest periods of 4 days (Table III). In this table, patients were arranged in two groups: one without previous treatment and the remaining after failure of previous treatment with aureomycin, chloramphenicol or terramycin.

RESULTS

Table I summarizes the results of treatment of 28 cases of brucellosis including the 20 cases reported in a previous report,[1] which by now have been subject to a minimum of one year of observation. From this table it is apparent that terramycin had a satisfactory suppressive effect on the symptomatology. It seems that, reinforced by an additional five day treatment, after a short period of rest, it has an apparently permanent therapeutic effect on 64 per cent of the patients.

It is of interest to note that a relatively high percentage of cases produce positive blood cultures in the course of the treatment even if the symptomatology had been suppressed. The usual time in which the temperature became normal was from 72 to 96 hours from the beginning of treatment. It is also of interest to note the higher tendency of recurrence in those cases treated before the fourth month of the infection.

It was obvious that the treatment in the cases presented in Table I failed to eradicate completely the infecting agent from the host. We do think that this was due to inadequate dosage, since a number of cases treated by others (not only with terramycin but also with aureomycin and chloramphenicol) had frequent recurrences even when a maximum of 4 to 9 Gm. a day was administered for periods of over 10 days. Since the suppression of symptoms was observed, regardless of the presence of

TABLE I

Patients with Active Brucellosis Treated with Terramycin in Daily Doses of 2.00 Gm. during 10 Consecutive Days Followed by an Additional 5 Days Treatment after a Rest Period of 5 Days

No. of Cases	Febrile Period Before Treatment	Febrile Period After		Blood Culture During Treatment		Recurrence	Recovery
		Less than 4 Days	More than 4 Days	Positive	Negative		
8	1 - 2 months	8	0	2	6	6	2
9	2 - 4 months	7	2	1	8	3	6
5	4 - 6 months	2	3	1	4	1	4
6	6 months or more	4	2	2	4	0	6
28		21	7	6	22	10 (36%)	18

TABLE II

Patients Treated with 30 - 50 Gm. Terramycin in Periods of 5 Days Interspaced by Periods of Rest of 5 Days (Observation after Treatment: 4 Months)

No. of Cases	Febrile Period Before Treatment	Febrile Period After		Blood Culture During Treatment		Recurrence	Recovery
		Less than 4 Days	More than 4 Days	Positive	Negative		
2	1 - 2 months	2	0	2	0	0	2
4	2 - 4 months	3	1	1	3	3	1
3	4 - 6 months	3	0	1	2	1	2
3	6 months or more	2	1	0	3	0	3
12		10	2	4	8	4 (33.3%)	8

circulating organisms, it was decided to reduce to five days the periods of administration of the drug, resuming the treatment after five days rest. A total of 30 to 50 Gm. of terramycin, in daily doses of 2 Gm., was administered in three to five series, interspaced by corresponding periods of rest. In this way we increased the time of treatment. Table II shows the results of this treatment in 12 patients. It may be noticed that blood cultures continued to be positive in 4 cases, but recurrences after eight months of observation were lower than in the previous series.

The limited supply of antibiotics caused a gradual reduction in the daily doses. The systematic evaluation of the results obtained in this study has been handicapped considerably by the increasing habit of using antibiotics, often without the advice of physicians. We have gathered, however, 18 cases who had had no previous antibiotic treatment. These cases are summarized in Table III in which it may be seen that recurrences were more frequent than in the previous series, but satisfactory suppressive results, with doses as small as 0.75 a day, cannot be denied. In the same table, 23 cases that had been treated previously with antibiotics, including 4 cases that had received moderate doses of terramycin, are illustrated. It may be seen that in such cases the percentages of recurrences have been relatively low. With respect to the time elapsed from the onset to the present treatment, the 44 cases shown in Table III can be classified as follows: 15 patients had been ill less than 60 days, 13 cases from 60 to 120 days, 1 case 170 days, 15 cases over 6 months.

TABLE III

Forty-four Cases of Brucellosis Treated with 0.75 Gm. of Terramycin a Day in Series of 3 to 4 Days Interspaced by Periods of 4 Days Rest

Febrile Periods Since Treatment		Cultures During Treatment		Relapses	Recoveries
Less than	More than	Positive	Negative		
18 Cases Not Previously Treated					
96 hrs.	96 hrs.				
16	2	3	15	3 (50%)	9
26 Cases with Previous Treatment					
23	3	3	23	3 (30%)	18

COMMENTS

In the present report we have presented the results of treatment with terramycin in 84 cases of *Br. melitensis* infection. Of these, 45 had been ill less than four months and the remaining for longer periods of time. All had a positive blood culture at the beginning of treatment and had a more or less intense febrile condition. The first group of 20 cases treated with terramycin, which have been reported elsewhere,[1] gave the impression that this drug had an activity similar to that of aureomycin. The suppressive effect of the symptomatology was quite spectacular in the majority of cases, in spite of the persistence in some of them of circulating organisms (detected by blood culture). This last finding suggested that it might be advisable to reinforce the first series of ten days treatment with an additional five days treatment, after a rest period of five days. At the present time, this first group supplemented by 8 more cases has been under observation for over one year.

In these 28 cases, there were 10 recurrences (36 per cent) which have been treated satisfactorily by one or two series of aureomycin or terramycin in moderate doses. From this preliminary observation, together with new cases, it is apparent that recurrences are more frequent in cases treated in the early stages of the infection, that it apparently is unnecessary to increase the daily doses of antibiotic, and that it is convenient to administer the drug for short periods of time interspaced with periods of rest. By this method the time of treatment is increased, while moderate doses of antibiotic are used. In justifying this therapeutic procedure, the following facts are taken into consideration:

1. Recurrences have not been quite so frequent in cases treated with chloramphenicol, aureomycin or terramycin, in higher dosage than that given to our patients.
2. The suppressive effect on the symptoms of active brucellosis takes place within 96 hours, regardless of the persistence of brucella organisms in the blood.
3. The suppressive effect is observed even with daily doses of 0.75 Gm. of terramycin for four days.
4. The effect of the bacteremia does not seem to be different with doses of 2 Gm. or of 0.75 Gm. daily.

If one recalls the studies on the pathogenesis of brucella infection,[6-8] in which it was emphasized that the role of the persistence of intracellular brucellae is to insure a constant source for reinfection, one realizes the probable uselessness of massive antibiotic therapy which may not affect the intracellular parasites and which has to be restricted to relatively short periods of treatment. We feel, therefore, that a better distribution of the antibiotic, given in moderate dosage, not only allows rapid and persistent suppression of the symptoms of active brucellosis but permits the evolution of natural defenses which in the end are the only source of defense against recurrences.

We wish to call attention to the importance of a thorough search for and elimination of secondary infections, such as dental abscesses or infected tonsils, which have considerable importance in a brucellosis patient. The neutrophiles are usually lowered in absolute numbers and are likely to fail as a check to the brucella infec-

tion, as well as to the secondary invaders. We are impressed particularly by the co-existence of bone lesions in patients suffering from brucellosis with dental abscesses.

Although we have no evidence of the definite effect of biologic therapy in preventing recurrences, we continue to favor the use of haptens, thereby aiming to prevent the state of hypersensitiveness which seems to be the cause of most of the manifestations of chronic brucellosis.*

SUMMARY

Terramycin has been applied to the treatment of *Br. melitensis* infection with results which are satisfactory. Recurrences are still frequent but readily checked by repetition of the treatment with the same drug or with aureomycin. The daily dose of 2 Gm. given for intermittent periods of five days interspaced by periods of five days' rest, giving a total of 30 to 40 Gm. of the drug, seems to be the best method of treatment. This dose may, however, be reduced to a minimum of 0.75 a day with results which are still quite satisfactory.

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* While this paper was in preparation, Knight et al. reported on the treatment of 12 patients with terramycin. These cases added to the series by Ruiz Sanchez et al[10] reinforce the increasing data concerning the value of the new drug against human brucellosis.

CLINICAL PSYCHOPATHOLOGY

Symposium on Insulin Shock Therapy*

George N. Thompson, M. D.
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INDICATIONS, TECHNIQUE, AND EVALUATION

George N. Thompson, M.D.

The broad subject of insulin therapy is of course more than can possibly be covered in a short symposium. This discussion must therefore be limited to some remarks concerning insulin shock treatment. It might be mentioned in passing that insulin is used for many purposes. In psychiatry it is used as a sedative and, as a tonic, it is used to increase appetite. It is of proven value in the treatment of patients with specific mental disease and has had long use as a treatment for drug addiction. In the fifteen years since insulin shock treatment was first developed, we have yet to find a satisfactory form of treatment to replace it. It remains the treatment of choice in certain disorders of psychiatry.

The indications for insulin shock treatment primarily are these: the cases of schizophrenia of paranoid type, of involutional psychosis, paranoid type, and perhaps some cases of psychoneurosis, anxiety type or anxiety state. These are the principal ones. It is not uncommon to treat paranoid schizophrenic patients with convulsive shock therapy (that is, electroshock) and to see them become progressively worse; nor is it unusual to treat patients suffering with involutional psychosis, paranoid type, with convulsive shock therapy and to have them either become worse or show no progress at all. It sometimes is necessary to treat patients suffering from various paranoid reactions to the point that their memories become extinct. Sometimes we must treat such patients until their intellects are seriously impaired, and when the intellect does begin to come back, the first that returns is the paranoid delusional state. These discouraging results with convulsive treatment in certain disorders are in large part responsible for a return to insulin shock therapy. It seems further that the principal indications are the ones herein mentioned. Some cases of the cyclothymic disorders, namely, manic-depressive psychosis, manic type, do not do well with convulsive shock therapy and show better results with insulin shock therapy. There are perhaps a few other unusual indications. Occasionally, patients cannot tolerate shock therapy electrically induced. Patients who cannot be given convulsive shock therapy because of irreparable damage to the spinal cord or for some other reason can receive insulin shock treatment, and not infrequently recovery of such patients is effected. These

* Given before the medical staff, Braewood Sanitarium, South Pasadena, California, on March 6, 1951, at its regular monthly meeting.

indications are of considerable importance in the management of the psychiatric patient.

TECHNIQUE

The original therapy that Dr. Sakel gave us has been modified considerably. The writer had most of his experience and training in insulin shock therapy with Dr. Jacob Frostig, who has materially modified the Sakel technique and has contributed to the improvement of insulin shock therapy. The Frostig technique, incidentally, is one that is now used at the Langley Porter clinic, and it is used in many other places. The technique is as follows. First of all, it is determined that the patient can take insulin shock treatment. Next, the necessary workup is decided. It is usually advisable to perform the routine laboratory work, blood count, and urinalysis and so forth, so that diabetes or any other serious contraindicating disorders may be ruled out. The technique of treatment begins with the injection of insulin; our technique is to have the nurse inject the patient with insulin at six o'clock in the morning. The treatment should be completed by ten, any delay being cause for suspicion that there is something wrong with the treatment. Although this varies with different patients, as a general rule the writer gives 40 units of insulin the first day and doubles the dose of insulin each day until the patient is in coma, so that on successive days he has 80,160, 320, and 640 units. However, if the patient has not entered shock by the time he has had 640 units, we do not go to 1280 but usually increase the dosage by about 100 units. In other words, from 640 we perhaps go to 750. Usually one need not give more than 600 or 700 units of insulin to get a patient in coma; we have, however, given as much as 1500 units of insulin without achieving coma. The patients are carried along day after day with this treatment, with some adjustments being made in the amount of insulin given. In the patient who has good command and in whom reactions are satisfactory, a reduction should be attempted. If, for instance, the patient is having an excellent coma on 700 units of insulin after perhaps ten or twelve days of treatment, the amount of insulin may sometimes be reduced by half. Interestingly, the patient usually has just as deep a coma with one half the amount of insulin that he had with the total amount. Later the amount of insulin can again be reduced by one half. Sometimes the writer has had patients on 700 or 800 units of insulin and then progressively has reduced the patients to 100 units of insulin, on which they still had virtually the same coma. The point at which the shock level becomes the sub-shock level, or vice versa, must be entirely a matter of the clinical reaction of the patient.

The duration of treatment is also a variable factor although it used to be said that the patient should have thirty comas. It seems that we are becoming less rigid on this point than formerly. One case recently was terminated by the writer after twenty-three comas, and the patient has had very good results thus far. In general, however, the patient with severe schizophrenia, paranoid type, should be given between thirty and forty comas as essential.

Insulin shock treatment is a dangerous form of treatment, far more dangerous than electroshock treatment. It has to be watched carefully, because the patient can die or, worse than death, can have a severe reaction with cerebral anoxia and turn out to be an idiot, living on in that state. The help of trained nurses is an absolute necessity. A doctor

cannot administer the treatment without the assistance of nurses who know their work; competent nursing assistance is of prime importance.

If the patient has extensive spasms, the rule is to terminate the treatment immediately, and a patient should never have extensive spasms for longer than fifteen minutes because he is in a dangerous state of deep shock. The technique of termination is a matter of considerable discussion. There are points of difference, one being whether it should be done by stomach tube or by intravenous injection. The writer finds it advisable to have both available. This treatment is sufficiently risky that one should have available a good lavage tube that can be inserted through the nose, and one should have available intravenous medications. Our own wish is to terminate most patients by lavage tube, and the principal reason for it is that we like to save their veins for emergencies; also, veins are very hard to get into, particularly when the patient is in deep shock or having flexor or extensor spasms. Furthermore, as patients gain weight, their veins become more and more difficult to find. They put on more subcutaneous tissue, and the veins are gradually lost, this being particularly true in women patients. It is felt that the lavage tube, size 26 French tube, is one of the greatest existing aids for insulin shock therapy. In a choice between either the tube or the intravenous, the tube would, it is believed, be the better selection. Occasionally, it is true, one will not be able to get the tube into a patient, but it is probably possible in every patient to terminate by lavage if one has all the necessary equipment.

THEORETICAL CONSIDERATIONS

We still do not know why insulin shock therapy helps patients. There are many theories but not much real progress in our knowledge of the process involved in the reversal of psychotic content through employment of shock therapy. The theory to which this writer subscribes is that insulin shock therapy acts as a stimulus to the metabolism of the individual. It boosts metabolism daily, and these surges of increased metabolism, working in a manner not well understood, are seemingly beneficial physiologically. There is an unknown "X" factor in psychiatry that has not been discovered, and that "X" factor is in some way involved here.

HAZARDS IN TREATMENT

The real hazard of insulin shock treatment, the greatest hazard of all, is protracted shock. A rather minor hazard is secondary shock. Secondary shock is herein termed a rather minor hazard because practically all patients can be brought out of secondary shock with an intravenous injection of glucose. The writer has never yet had a patient who could not be brought out of secondary shock. It might even be called beneficial in a minor way, since on the same day the patient receives another, gratuitous, treatment. Protracted shock, on the other hand, is a grave danger, and it is something that is not fully understood. This is the case of the patient who is in coma, who is terminated and does not come out of shock. He is given an intravenous injection of glucose but continues in shock. Cases of this nature have been studied carefully. It has been found that the blood sugars can be brought up to an extremely high level, four, five, or six times the normal

level of blood sugar, and yet the patients remain in shock. Until an answer is found to this medical problem, some patients will become critically ill or die.

ECONOMIC CONSIDERATIONS

The final factor to be considered is the economic one. Insulin shock therapy fell into disrepute largely because it is so costly. It is costly in time; it is costly in the time of doctors and the time of nurses. It became so costly, in fact, that the California state hospital system discontinued it in all of its state hospitals for a number of years. Despite the fine work of Dr. Frostig in California, it was discontinued. It was later resumed at the Langley Porter Clinic. Now it seems that they are using it to some extent at Mendocino State Hospital, but its use is still economically impossible or almost impossible in the average state hospital. In the sanitaria the cost to private patients for insulin shock treatment is at least twice and possibly three times that of electroshock treatment, the reason for this again being the matter of time consumed in its administration. A doctor can give an electroshock treatment with two attendants, or with a nurse and one attendant, and be finished in a few minutes. But when he is giving an insulin shock treatment, it entails several hours of his time and many hours of nursing time.

During World War II, insulin shock therapy was used in England on large numbers of patients, particularly military patients. The nation was so economically stricken that they did not have sugar to give these patients. It is, then, not only a matter of time, but also a matter of materials that contribute to the problem. Dr. Roger McClay came over to show his American colleagues the technique that was finally evolved. He reported that they made an emulsion of potatoes and put them down into the lavage tube instead of sugar.

CONCLUSION

Patients have recovered under insulin shock therapy who have not improved under other types of treatment, including some who have been given prolonged psychoanalysis without success and others who have had prefrontal lobotomy and have not recovered. It is believed that insulin treatment will continue to maintain a position of importance in the field of psychiatry.

DISCUSSION

Clarence W. Olsen, M.D.

The method of treatment used in England during World War II and mentioned by Dr. Thompson is still being used. This writer investigated in order to enlarge upon Dr. Thompson's remarks. A paper by authors, McGregor and Sanderson, was studied. In it they state that they gave insulin intravenously and thought that they economized on the insulin. Some of the American workers have confirmed that and others have said that it was a wasteful way to use insulin and that it does not seem to be as effective intravenously. This writer experimented on a few patients, finding the treatment to be economical in some ways; the reaction set in at an earlier interval after the injection than with the ordinary hypodermic injection. The patient also seemed to go into coma more quietly and with less excitement. Then after a short interval, perhaps an hour or an hour and a quarter, the effect of the insulin wore off and the patient began to show spon-

taneous recovery from the shock dose. It is thought that this partly explains the success in sustaining the patient with potato broth rather than sweetened orange juice. Other points mentioned by these authors were found to be true: there was much secondary shock; the amount of carbohydrate required to get the patient out of shock was considerably less. In fact, some patients went through the two or two and one-half hour treatment and were able to eat breakfast, with perhaps a little extra orange juice but without any tendency to nausea or vomiting, and they did not seem to need additional interval feedings during the day. As a result the patients did not fatten as much as with subcutaneous injections of insulin, and their needs for vitamin B were presumably less than those who took a very large quantity of carbohydrate. Thus there were quite a few advantages experienced. We saw no more convulsions and no more protracted shock. This writer, in fact, did not see any protracted shock with either the methods that Dr. Frostig demonstrated or with the methods of the English doctors. The depth of the shock seemed to be definitely less than with the method done subcutaneously. Benefits to the patient seemed to be about the same, although of course we did not have any great number of patients, so as to develop comparative statistics. All in all, at least for the type of patients who did not require a very deep coma, but needed something more than simply subshock treatment, this method in the writer's experience has proved to be very practical. So far as can now be seen, it is not any more dangerous and may perhaps be safer than the standard methods of treatment.

NURSING IN RELATION TO INSULIN THERAPY

Jenevieve J. Newton, R.N.

The nursing procedure for insulin therapy patients begins the night before treatment in that we discontinue all liquids and solids by mouth at 7 p.m., the only exception being the regularly ordered bedtime medication. Patients are allowed to sleep in their own rooms until 5:30 a.m., at which time they are taken to the insulin rooms where temperature, pulse, respiration, and blood pressure are taken, and they are put into bed in restraint. Waist belts are the only restraint used until the patient approaches the point of coma. Thereafter, full restraint is applied until the series of treatments has been terminated.

At approximately six o'clock in the morning the insulin is injected with a two-inch needle into the buttocks. No attempt is made to seal the puncture as there seems to be no seepage when the long needle is used. After the medication has been given, the patients sleep until seven o'clock, at which time two attendants go into the treatment rooms to check all restraints, see that the patients are covered adequately, that the lights are dimmed, and that there are no drafts. Temperature, pulse, and respiration are taken and recorded every fifteen minutes until treatment has been terminated. At about 7:15 a.m., two or three of the registered nurses go into the treatment rooms to begin checking blood pressures every hour and generally observing and recording the reaction of each patient: skin warm and dry, perspiring profusely, quiet, restless, noisy, excess mucus, grimacing, rhythmic twitching of the facial muscles, extensor spasms, flexor spasms, pupils fixed, apparently in shock, or whatever the condition may be.

After the first general check, the insulin table is set up for routine use and for emergencies, also the tray for tube feedings with the tubes on ice, the glycerine for lubrication, the large pitchers of glucose solution, and the tray containing the solution for by-mouth feedings for patients who do not go into coma. Routinely, here, we use black tea and brown sugar since the patients find it more palatable than orange juice and white sugar, and there are fewer instances of unpleasant after-effects such as nausea, vomiting, or loose stools. Next, we have a tray set up with several syringes containing 30 cc. of 25 per cent glucose for intravenous termination of treatment,

several 5 cc. syringes containing 1⅞ grains of sodium amytal or 3¾ grains for intravenous injection, and often 5 grains of sodium luminal and 7½ grains of sodium amytal for intramuscular injection. The hypnotics are used as necessary to control undesirable symptoms during treatment such as noisiness, facial twitching, and jerking of the extremities, and for excessive restlessness which when uncontrolled might produce a mild state of exhaustion. Available, also, on the insulin table are stimulants such as coramine and caffeine, padded mouth gags to protect the teeth, and hard rubber airways for use in instances where there is excess mucus or when the tongue relaxes and interferes with breathing. The emergency oxygen unit and the electric suction unit, equipped with an airway and a catheter, are at hand constantly.

At 9:30 or shortly thereafter, all treatments are terminated with feedings by mouth, by tube feeding, by intravenous injection, or by a combination of two methods. When a tube-fed patient does not respond in five or ten minutes, he is given glucose into the vein. After the initial feeding, the swallowing reflex is tested with water before breakfast is served. A supervised bath follows, and all patients are urged to take only mild exercise, to spend the day within the hospital proper or on the grounds, and to report promptly any symptoms that might indicate the approach of a secondary reaction. Disturbed patients and bed patients are checked every fifteen minutes throughout the day and night. Secondary reactions are managed in the same manner as are the treatments. All treatment patients are given midafternoon feedings and early evening feedings in addition to regular meals, and extra salt is given in the form of Theratabs.

It is interesting to note that, though no two patients will react to insulin therapy in the same manner, an individual patient will follow the same general pattern throughout the entire course of treatments. The patient who develops excess mucus during the first deep coma will continue to do so until the condition has been controlled with atropine. A tendency to be noisy, to be restless, or to grimace will reappear in each successive treatment. Neither the amount of insulin given nor the depth of the coma achieved seems to alter this fact.

Between twelve and sixteen patients have been thus treated with insulin therapy five days a week for the past several months. In some instances insulin was the initial treatment given; however, often insulin shock therapy has been used as a follow-up to electroshock therapy. There have been no insulin accidents, and it is felt that our insulin therapy has been achieving quite remarkable results.

CLINICAL RESEARCH GRANT

A grant in aid of a clinical research project in industrial medicine, involving arthritic and spastic conditions, has been made by the A. H. Robins Company, Inc., of Richmond, Virginia. The study will be set up with Dr. Frank Barden, Medical Director of the Saco-Lowell Shops of Biddeford, Maine, as coordinator, and with the participation of four physicians and surgeons in general practice: Drs. Kenneth J. Cuneo, Paul S. Hill, Jr., Robert S. LaFond and William F. Mahaney. By this collaboration, illnesses frequently encountered in industry can be followed through the stages of continuing treatment by the employee's own doctor, at home and at Webber Hospital in Biddeford. The Saco-Lowell Shops, manufacturers of textile machinery, employ about 4,750 persons at plants in Biddeford and Sanford, Maine, and Charlotte, North Carolina.

Dr. Barden said subjects will be selected from several hundred employees suffering from arthritis or various spastic conditions. In arthritis, therapy with salicylates and Pabalate will be compared. For spastic complaints, belladonna will serve as a control in investigating the results obtained with the antispasmodic, Donnatal. Observations are to continue for six months. They will be facilitated by x-ray and laboratory work already performed under group and individual insurance plans and supplemented by additional tests as indicated.

Psychological Motifs in the Works of the Norwegian Sculptor, Gustav Vigeland

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FOREWORD

by

Félix Martí-Ibáñez

One leaves Norway, land of giants, through a gate of Colossi: Frogner Park—home of some of the most fabulous statues ever created by human hands. Seven huge gates of wrought iron form an imposing entrance worthy of this park on the outskirts of Oslo. Everything there, from the magnificent portal up to the monumental monolith which is its culmination, is the work of the same artist—a giant among giants—Gustav Adolf Vigeland.

This is an artist who played at being God, who transfigured the human race before copying it, and who with powerful hands modelled it perfect, heroic, triumphant. It is the mad dream of an artist with a unique sense of plasticity and a genius for beauty and might.

The portal is embellished with fantastic arabesques, sometimes geometric, sometimes flowing, symbolizing the crystallized and amorphous forms in which life in this world began. Beyond the entrance, across a shady gravel square, stands the first group of statues, the reptiles. Stone dragons with half-diabolic, half-lewd expressions, some of them clutching madonna-like women who in vain try to escape the monstors' embraces, rise like a colossal threat against the skies. These animals symbolize the demoniac forces struggling against man. One woman in the powerful arms of a dragon endeavors to avoid his embrace, but her Mona Lisa smile and the lack of conviction in her resistance denote that she is not trying too hard to escape him.

The age of reptiles slowly yields to another age; a new form of life replaces the old. Only a few steps from the reptiles stands a bridge across a lake, like the span of time through the ages, and on the balustrades of the bridge parade fifty-eight bronze groups representing a dramatic study of the entire evolution of the human being—male and female—from the moment of conception (the embryos ride a unicorn symbolizing the sexual forces on earth), up to maturity: babies, children, young athletes, couples, duos and trios, Herculean men, matrons and Walkyries, naked Amazons and Vikings, their thick muscles, dark flesh, and overpowering bone structure unconstrained, joyous in their self-assertion, powerful in their freedom. Striking attitudes of challenge and triumph, attack and victory, they seem to be shouting to the entire world what mankind might have been if God had created it in the image of Vigeland's conception instead of having made it what it is.

Vigeland's types are universal, but in every face, in every gesture of the hands, the vibrant torsos, the breasts swollen with the sap of youth, the thighs as robust as oaks, the elastic ankles, the clenched fists and the bellies bursting with new life, there is an expression of the drama of glory of each individual as the synthesis of the drama and glory of mankind. When and if the world comes to an end and the human race ceases to be, these bronze statues will continue standing, fierce and indestructible, an everlasting monument to the beauty and strength our race might have had.

Beyond the bridge there are fountains surrounded by figures of giants, their hair and eye-sockets pouring water, spraying the young girls strolling by who accentuate the hardness of the bronzes with their blonde frailness.

Then come white and gray marble stairs, hundreds of steps, and on the top, surrounded by thirty-six enormous groups like titanic guardians, rises the monolith.

The monolith is over 53 feet high, with 121 nude figures (nude flesh—the uniform of Vigeland's human armada) twisting and winding around one single block of granite. This block originally weighed 470 tons, perhaps the largest monolith since the Egyptian obelisks and those of the Jupiter-Baal temple in Baalbeck.

The granite was excavated from a Norwegian quarry near the Swedish border. Over twelve pounds of dynamite were used to loosen the block, and on April 4, 1922, it fell on the side of the quarry. After it was reduced by 200 tons to facilitate its transportation, the block was placed on two gigantic rafts and transported to Oslo, where it arrived in 1926. No Norwegian boat would take the risk of transporting it, for any slight swell of the sea might have sunk the colossus forever.

Then the epic of its overland transportation began. Cranes, dredges, pullies, cars, springboards were all used in the effort. The heaviest wheels capsized, steel levers broke, sweaty torsos were reduced to exhaustion. The transportation of this stone giant was indeed a task for giants.

On some days the block of stone advanced only six to eight feet through the streets of Oslo. The greatest progress made on any one day was two hundred feet. This slow march lasted from August 1926 to February 1937. When the stone reached the park, scaffolds were set up, cranes were back on the job, and men with blackened bodies and gritting teeth again spat on their bleeding hands. Thus, the monolith was baptized—with drops of sweat and blood.

This was a new saga of the Nordic gods: giants of flesh transporting the stone Titan. Finally the stone was set up, and nearby a wooden shelter was constructed to house the lapidaries who would cut the stone. The sculptor had taken ten months to make a model of the actual size of the monolith; now three men spent thirteen years carving the stone.

In 1942 Christmas bells provided the music for the motionless dance of the twisting figures around the monolith when it was uneveiled. "The monolith," said Vigeland, "is my Religion." He might have added that it is the soul of Norway.

Covered with nude figures stretching up in a desperate effort to reach its apex, the monolith is the drama of Mankind in its course through life. It begins with the prodigious exuberance of Nature in children, and ends with the dead who have already reached the end of their journey. And the symphony of life plays on between these

two extremes. In writhing vibrations, the naked forms pile up: thighs, torsos, arms, ankles, calves, loins, chests, and heads, a suffering humanity seeking an explanation for its torments, struggling to reach the top, aspiring to ascend from mud to the supreme blue.

Gustav Adolf Vigeland, pride and symbol of Norway, was born in Mandal, Norway, in 1869. His life in the main was one of poverty. He spent Christmases in Oslo, with only his dreams for food and the light of the cold lofty stars for drink. He struggled, suffered; in short, he was a soldier in the holy army of misfortune. He worked in Denmark, Sweden, France and England. He died of a cerebral hemorrhage in 1943 during the Nazi occupation of Norway.

From 1907 to the moment he died, his entire life was consecrated to the creation of his park, in which he left his philosophy of life.

The winds of madness lashed him many times. Finally, after half a century of work, he fell exhausted at the foot of his Monolith, another Titan sacrificed at the altar of fame. And now his spirit is evoked by his statues that are an almost living folklore which has been incorporated into Norwegian life.

A visit to Vigeland's statues in the park is like looking into the open-air workshop of a Nordic Michael Angelo. The mind of the Norwegian sculptor seethed with a joyous humanity which, in bronze and granite, still smiles at History

And when the setting sun tints the Monolith in crimson, one feels as if one were looking at the gigantic bloody sword of the last Viking of Norway.

FIGURE 9 (See Page 183)

FIGURE 1

MOTIFS IN THE WORKS OF VIGELAND*

Ingjald Nissen

Until now the sculpture of Gustav Vigeland has not been analyzed from the standpoint of analytical psychology, although there is little doubt that his work will be interpreted by psychologists for centuries to come. At this time, however, only a very preliminary interpretation will be presented.

There are three different approaches in determining the meaning of a work or art. One may try to determine what the artist has consciously attempted to express in his work; what the artist unconsciously has expressed in his work; and what meaning is evident in the work itself.

In this paper, an attempt will be made to interpret some of Vigeland's works in the light of their self-evident meaning. This, of course, does not exclude the possibility that Vigeland unconsciously has expressed the themes we discover in his work; nor does it exclude the fact that Vigeland perhaps intentionally put into his work the very meaning that we find there. I hold it probable that, in the sculpture analyzed here, Vigeland has intended to express my own interpretation. But one must remember that, even if Vigeland himself had not intended what we see in his work, or even had specifically denied any such intention, our interpretation would be no less valid.

*First read at the XIII International Congress of Psychology, held in Stockholm July 1951.

There are so many complicated personality problems evident in Vigeland's work that the greatest opportunity for symbolic interpretation is offered. A single illustration of an interpretation based on Freud's theory of symbolism is one of the reliefs on the fountain (Fig. 1).

Various themes may be pointed out in this work. The unicorn, however, is a well known symbol of male sexuality. Possibilities for symbolic interpretation of this kind may be found throughout Vigeland's sculpting. But perhaps the greatest quality of his creation is that it is possible to give more exact, more profound interpretations, interpretations which prove to what a great degree Vigeland studied and understood human nature.

FIGURE 3

Another example of Vigeland's genius is a statue located on the right side of the bridge (Fig. 2); here a little boy is sitting on the head of an older boy. The little boy is frightened by his precarious position. But, at the same time, it is his duty to be courageous; he must be a man. These two emotions become combined in sternness. The work is thus an expression of the masculinity complex and shows an important psychologic moment in the development of the male individual. The mental attitude of the boy is revealed by his defiant attitude toward the outside world, especially expressed by his truculent facial expression and the belligerent bearing of his arms and clenched fists.

A similar statue (Fig. 3) stands on the left side of the bridge. This one depicts a small girl sitting on the head of an older girl. The child, in this case, is afraid, too, but here fear is compensated for by the fact that woman is not burdened by full responsibility. It is dangerous to talk of the psychology of woman! I do not mean to say that woman is an irresponsible creature. But it may perhaps be said that both men and women have been inclined to give woman something of a privilege in not holding her responsible for the course of events. If this is so, we may say that, in this piece, the combination of the fear caused by the situation and the feeling of security, resulting from the fact that she is not burdened with the whole responsibility, together produce the attitude of the girl, as evidenced by the gleeful expression on her face and the open bearing of her arms.

FIGURE 4

In one of the reliefs on the fountain (Fig. 4), the inferiority complex with its compensations is denoted. If this is true, it may be considered whether the work expresses this complex as described by Adler or the castration complex which Freud describes.

FIGURE 5

If this work is also considered as an illustration of the impulses and eventual complexes in woman, disturbing perspectives are opened. Perhaps the man after all is not the main figure of the two.

A pair on the right side of the bridge (Fig. 5) make another interesting study. Although two persons are represented, this work appears to express self-satisfaction. There is no question of rape. In the woman there is no fear and protest indicating a rape. Nor does the work represent the so-called eternal loneliness of man. Neither in the man nor in the woman is there anything indicating that loneliness is a problem for them. In neither of them is there an expression of longing for contact with another individual, or an expression of the tragedy that contact is not possible.

Interpretation of this work must start with the fact that it is wholly without what we call erotic feeling. Eroticism only appears when there is a feeling of reciprocity between two persons. It is essential to the concept of erotic sentiment that there be some communication from one individual to another. But in this work, there is nothing of this communication. In the closed expression on the face of the man there is nothing indicating erotic fascination. In his violent striding along there is nothing indicating *what* he carries, *why* he carries, and *to what place* he carries. The man is only an exposition of self-centered strength.

FIGURE 6

The lack of erotic fascination is even more apparent in the woman. The expression on her face and her entire attitude indicate that the woman is occupied by her own passion. She is experiencing herself.

Should one wish to stress the specific moment, one might say that for each individual the other is only a symbol of sexuality. Both individuals are in this sense alone. A basis in psychologic theory for this interpretation may be found in Jung's writings; Jung is of the opinion that the male individual has in himself something of the female (*anima*), while the female has a certain male element

(*animus*). This interpretation is strengthened by a study of the expression on the faces, particularly that of the woman (Fig. 6).

The "official" interpretation of a pair of statues on the right side of the bridge (Fig. 7) is as follows: "An older man advises a younger man to go out into society and perform his tasks." A totally different interpretation may be made, however. This piece may be considered an expression of homosexuality. The older man is the normal man; the younger is the abnormal.

FIGURE 7

The masculinity of the older is denoted by the placing of his arms behind his back, the forward, positive inclination of his head, and the firm planting of his weight on both feet; the femininity of the younger is emphasized by the position of the legs, the placement of the hands upon his thighs, and the obesity around the hips.

It is often said that there are subjects which the artist cannot and ought not to treat. The greater the artist, however, the more possible it is for him to express all problems and situations. Vigeland in his relief of two women (Fig. 8) depicts the problem of lesbianism. One may perhaps say that here female homosexuality is treated with the greatest understanding, with the greatest discretion, and at the same time with the greatest clarity. Even here it is the problem of the individual with which the artist is concerned.

The last piece (Fig. 9, see page 197) is a work which, in my opinion, is one of the most moving and beautiful works of art ever created by man. It is the fourth of the reliefs around the fountain. I doubt whether anyone could disagree that this sculpture depicts the phenomenon which we call the *dream*. This is especially evident from the expression on the face of the boy. The power of the dream experience is expressed by the difference between the outstanding figure of the dream picture and the almost transparent form of the dreamer. The paradoxical nature of the dream is stressed by the placing of the dream picture in an experimental attitude with the head downwards.

FIGURE 8

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FIGURE 8

GENERAL PRACTICE CLINICS

VOL. 9 NO. 3 MARCH 1952

CONFERENCE on ELECTRONIC INSTRUMENTATION and NUCLEONICS IN MEDICINE*

90. *A Cobalt 60 Irradiator for Teletherapy*. E. DALE TROUT AND JOHN VLACH, Milwaukee, Wis.

A container has been constructed for a 1250-curie Cobalt 60 source. The unit has been designed for medical use in the treatment of deep-seated cancer. The reasons for the basic design element are discussed along with the medical application influencing the design. The container is constructed of Hevimet, a tungsten alloy, which with the mechanism for initiating and terminating the treatment insures adequate protection against radiation at all times.

91. *Scintillation Counting For Brain Tumor Localization*. BERTRAM SELVERSTONE, M.D., Department of Neurosurgery, Tufts College Medical School, AND WALDRON S. MACDONALD, AND WILLIAM E. C. EUSTIS, Boston, Mass.

Precise localization of cerebral tumors at operations is now readily accomplished by detection of the beta omission of phosphate ion concentrated by the neoplasm. Preoperative *external* detection of such lesions imposes three new requirements. A gamma omitter selectively concentrated in the tumor is a first necessity. High gamma counting efficiency is required in order that the detector may be removed from contact with the head, minimizing the effect of the irreducible surface activity. Volume sensitivity of the gamma detector must also be high in order to permit sufficient shielding to provide directional counting without undue bulk.

Diiodofluorescein was first employed by the Minneapolis group, who were able to

*Presented here with the permission of the Institute are abstracts of technical papers read at the Fourth Conference on Electronic Instrumentation and Nucleonics in Medicine of the American Institute of Electrical Engineers. The conference was held at the Hotel Commodore in New York, January 7-8, 1952.

obtain useful results by means of Geiger-Muller counters. Introduction of E^{42} by the Boston group made high gamma efficiency and volume sensitivity more critical. Scintillation counting appeared to be a logical approach to these problems, and furnished a practical tool for external tumor diagnosis. Thermionic background was reduced by coincidence techniques without sacrificing high counter efficiency. The Durham group has now introduced the promising method of detection of the annihilation radiation of positrons. Both scintillation counting and the coincidence technique appear to be necessary in this latest development.

Methods and results of external brain tumor localization are presented.

92. *A Fluoroscopic Screen Intensifier for Medical Use.* RUSSEL H. MORGAN, M.D., Professor of Radiology, Johns Hopkins Medical School, Baltimore, Md. AND RALPH E. STURM, Physicist, Johns Hopkins Medical School, Baltimore, Md.

The x-ray light intensity developed by conventional x-ray fluoroscopic screens is extremely low. This restricts the resolution of the fluoroscopic images and requires the operator to adapt his eyes for considerable periods before fluoroscopy is begun. It has been theoretically shown that these difficulties might be largely resolved by intensifying the fluoroscopic screen by a factor of several thousand times.

An electronic screen intensification system, using a conventional fluoroscopic screen, a Schmidt optical system, a sensitive image orthicon, a conventional wide-band television amplifier and a kinescope, has recently been completed in the laboratories of the department of Radiology of the Johns Hopkins Hospital. This instrument provides a gain in screen brightness of approximately 10,000 times and a gain in optical resolution of approximately two times.

The performance of the device will be demonstrated by means of motion pictures. The discussion will also include a consideration of the limitations of the instrument as it now stands.

93. *Television in Medicine and Biology.* VLADIMIR K. ZWORYKIN AND LESLIE E. FLORY, RCA Laboratories, Princeton, N. J.

Broadcast television has proved an effective method of presenting the methods and findings of the biological sciences to the general public. The popularizing role of television is overshadowed, however, by its potentialities for research, teaching, and clinical diagnosis.

The most effective television tool in these fields is, probably, the television microscope. The compact Vidicon camera mounted over the microscope, linked to a receiver-monitor, permits the continuous observation of tissues and microorganisms under conditions of optimum contrast. With ultraviolet-sensitive Vidicons the exploration of specimens with ultraviolet illumination becomes as simple and direct as for illumination with visible light; the strong differential absorptions in this range of the spectrum render this procedure particularly effective.

In the class room the possibility of simultaneous observations of greatly enlarged images of microspecimens is a material aid in teaching. In the operating theater the

television camera provides medical students with close-ups of operations without interfering with their progress. Stereo cameras and receivers can give an insight into operating technic which cannot be conveyed to groups by any other means.

Television methods have already proved of value in accelerating and increasing the accuracy of diagnostic tests. Examples are electronic blood counting and the identification of pathological cells in cancer examinations by scanning in a manner similar to television. Also the mapping of skin potentials by simplified television technics promises to give more immediate insight into cardiac and other pathologic conditions.

The discussion will be followed by a demonstration of the television microscope with visible and ultraviolet illumination.

94. *Wave Propagation in the Living Human Artery.* MILTON LANDOWNE, M.D. National Heart Institute, Bethesda, Md. and Baltimore City Hospitals, Baltimore, Md.

The pulse represents an arterial deformation due to the pressure wave propagated from the heart. Historically, systems of medical diagnosis were based upon examination of the pulse. In physiology use of the pulse wave velocity as an index of vessel elasticity assumes arterial equivalence to a cylindrical tube with ideal elastic properties, and records some function of the deformation at two separated sites overlying the vessel. The uncertainties in measurements time, distance, and pressure probably exceed errors of assumption and theory.

Some of these theoretical and technical limitations may now be overcome. Living tissues when stressed exhibit prominent non-Hookian characteristics ascribed to reorientation of long chain molecules. King (1946) has extended a theory of such elastometric behavior to arteries. We have been able to superimpose frequent brief pressure waves upon the ambient pressure in intact human arteries. These are detected by suitably placed intra-arterial needle and transducer, enabling the velocity of pressure wave propagation and the attenuation characteristics of the system to be determined over a range of pressures in each subject. The instrumentation provides for resolution of time to 1 m sec. or better, and of pressure to 1 per cent with suitable frequency and phase characteristics from 0 to over 100 cycles per second.

Velocity increases with pressure, approximately doubling the physiologic range. In the majority of subjects this relation may be expressed mathematically, with an average deviation less than 3 per cent. These observations, which yield information concerned with the elastic and viscous properties of a vessel in its living environment, are being studied in relation to age and disease.

95. *A Mechanical Heart for Artificial Maintenance of the Circulation.* S. A. WESLOWSKI, M.D., Tufts College Medical School, Boston Mass. AND C. STUART WELCH, M.D., New England Center Hospital, Boston, Mass.

This communication describes a simple mechanical pump which has been used successfully in experimental animals to replace the function of the right side or the left side of the heart or both sides simultaneously by artificial maintenance of the pulmonary and/or systemic circulations respectively. In one series of experiments the animals own lungs were used as the means of oxygenation of the blood. In another

group of experiments the entire cardio-respiratory function was "replaced" by use of the same simple pumps in series with an extirpated set of lungs from another animal.

In this report the results of simple maintenance of the greater and lesser circulation singly and simultaneously will be described. The recovery rate of animals subjected to these procedures was in the neighborhood of 75 per cent when the period of artificial maintenance of the circulation varied from one to one and one-half hours. At the time of this writing five out of five animals have survived extracorporeal replacement of the cardiorespiratory system for a period of two hours. Physiologic data obtained during these experiments will be presented. Possible uses of simple pump mechanisms will be described in relation to experimental cardiac surgery.

96. *Physical Response Requirements of Pressure Transducers for the Reproduction of Physiological Phenomena.* EARL H. WOOD, Mayo Clinic, Rochester, Minn.

Intrabrachial arterial pressure was photographed continuously while intraradial pressure was simultaneously recorded from the same arm, with the use of 5 manometer systems of different dynamic response. Dynamic response of the radial manometer was varied by connection to galvanometers of different dynamic characteristics or by restriction between the strain gage and arterial needle. Response of manometer systems to sine and square-wave pressures was recorded after each experiment by means of a hydraulic oscillator (Isaacson, James and Jones, R. E.: Am. J. Physiol. *163*:722-23 Dec. 1950). Differences in the radial systolic pressure were not detected in 11 normal persons and 5 hypertensive patients by the use of manometer systems with uniform response to 6 cps and more. A decrease in radial systolic pressure averaging 4 mm. Hg (p value 0.01) was detected with use of an overdamped manometer system with uniform response to 1 cycle per second. Systolic pressures were not significantly different as recorded with underdamped and overdamped manometers with sensitivities at 40 cps of 290 and 35 per cent of static response, respectively. No manometer system produced significant variations in diastolic or mean radial minus brachial pressures. Distortion or contour determined by alterations in onset or build-up time of pulse wave could be detected, at the chart speed used (29 millimeters per second), only by the use of overdamped systems with a uniform sensitivity from 0 to 4 cycles per second.

97. *Analysis of Viscous and Elastic Properties of the Respiratory System by Electric Circuit Theory and Electronic Measurement Technique.* JERE MEDE, M.D., Harvard School of Public Health; AND ARTHUR MILLER, Cambridge, Mass.

A recording, as a function of time, of the rate of flow of air into and out of the lungs during respiration roughly resembles a sine wave. The relationships of the air flow to the pressure difference between the surface of the lungs and the mouth (the intrapleural pressure) are analogous to the current-voltage relationships in a simple resistance-capacitance network where the viscous friction of the tubular system of the respiratory tract to air flow corresponds to the resistance, and the elastic compliance of the lungs corresponds to the capacitance. In such a system the volume change of the

lungs is proportional to that portion of the intrapleural pressure associated with their elastic compliance, while the remainder of the pressure represents the drop due to the viscous resistance.

If the rate of flow and pressure are measured by electrical transducers, the voltages so obtained can be integrated to obtain volume, and the required addition or subtraction processes carried out by appropriate electrical circuits, so that voltages closely approximating both the "viscous resistance" pressure drop, and the "elastic compliance" pressure drop are immediately and continuously available. When these variables are plotted, respectively, against rate of flow and volume change by means of a cathode-ray oscilloscope, direct expressions of the "viscous resistance" and the "elastic compliance" are obtained.

These methods are readily applied in many by utilizing intra-esophageal pressure as an index of intrapleural pressure variations. Striking alterations of these physical properties occur in disease. The significance of these changes in a variety of conditions including asthma, emphysema, and pulmonary congestion is discussed.

Details of the transducers, their associated amplifiers, and the computing circuits are given.

98. *A Monitor of Physiological Variables for Anesthesia and Other Uses.* S. R. GILFORD, Electronics Division, National Bureau of Standards, Washington, D. C.

During anesthesia and surgery, periodic checks are made of blood pressure, pulse rate, and respiratory function of the patient, as an index to his condition. Because of other responsibilities, it is often difficult for the anesthesiologist to make these necessary observations regularly. The instrument to be described obtains this information automatically and presents it as a continuous indication on a conveniently located instrument panel.

The monitoring equipment measures, indicates, and records systolic and diastolic blood pressure, pulse rate and arrhythmias, and respiration rate and minute volume. All measurements are obtained using procedures simple to apply and involving no patient discomfort. Blood pressure is measured employing occluding cuff inflated on a time schedule by a programming switch. Observations are made every three minutes. Heart rate is indicated by an instantaneous cardiotachometer which measures the time interval between adjacent "R" waves of the cardiac potential. An adjunct to the cardiotachometer gives warning of possibly dangerous cardiac irregularities by measuring the rate of occurrence of time variations between adjacent "R" to "R" wave intervals. Respiration volume is measured with a positive displacement flow meter operating over a fixed timing interval. Rate is obtained by the integration of individual respirations over the same timing interval.

In addition to recording all measurements on a multichannel recorder, provision is made for preserving and indicating in the operating room the last observation in the case of the measurements, such as blood pressure, that are made periodically.

The equipment is built into two units: one unit to be kept outside the operating room contains the recorder, power supplies, and other circuitry not essential in the

operating room; the second unit located close to the anesthesiologist contains indicating instruments, controls and such circuitry that must be located in close proximity to the patient. The operating room equipment employs a pressurized cabinet with a positive purging pressure and suitable interlocks to insure safety in the presence of combustible gas mixtures.

This monitor can of course be used in any physiologic experiments where it is necessary to read or indicate such variables over a long period of time.

99. *The Application of Electrical and Acoustic Impedance Measuring Techniques to Problems of Diathermy.* HERMAN SCHWAN, Department of Physical Medicine, Graduate School of Medicine; E. L. CARSTENSEN, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pa.

Certain aspects of electromagnetic and ultrasonic diathermy may be evaluated quantitatively through the electrical and acoustic impedance of the body tissues. This process is applied to a study of the problem of localized, deep heating.

The dielectric constant and conductivity of blood have been measured in the range from 100-1000 megacycles by a resonance method, using an open-wire transmission line. These data are compared with the results of others at higher and lower frequencies and found to be in good agreement. Blood and tissues of high water content have similar electrical properties at diathermy frequencies. From the impedance data depths of penetration are calculated which indicate that for frequencies above 2000 megacycles, electro-magnetic diathermy is only slightly more effective than infra red.

The absorption and velocity of sound in blood and blood components have been measured in the range 800-2400 kilocycles by amplitude and phase comparison methods. The velocity in blood is very nearly equal to that of water, but the absorption is somewhat higher and appears to be related to the presence of proteins in the red cells and in solution. Estimates of the absorption for tissues are made and depths of penetration of the ultrasonic energy are computed. A comparison of these data with those for electromagnetic radiation, plus a consideration of the wavelength necessary to provide good beaming, shows ultrasonic diathermy to be superior for the purposes of localized deep heating.

100. *Physiologic Measurements of Interest to the Clinical Anesthesiologist.* ALBERT FAULCONER, M.D., Mayo Clinic, Rochester, Minn.

For more than 100 years most research effort in the field of anesthesiology has been devoted to the discovery, investigation, and exploitation of new anesthetic agents and methods for their use. The direction of recent investigations has shifted. Attention is now centered on the physiologic responses to the drugs and agents used. Many of these responses cannot be estimated accurately and quantitatively by application of the five unaided fundamental senses.

Fields immediately inviting the services of engineers include (1) estimation of the state of oxygenation of blood and other tissues, (2) devices indicating quantitatively

the amount of gas respired per unit time by the patient, (3) some means for the continuous indication of changes in pH of the blood, (4) apparatus for the continuous indication of pressure in the circulatory system (venous and arterial), (5) electrocardiography, (6) a method for the quantitative estimate of blood flow, (7) instrumentation providing quantitative information regarding the state of neuromuscular transmission, (8) suitable equipment for the presentation of information to be derived from the electrical activity of the brain, and (9) engineering of all of these items to a point of practicality which will make them easily usable in operating room practice.

101. *Instrumentation for the Electronic Control of Anesthesia.* R. G. BICKFORD, Mayo Clinic, Rochester, Minn.

Observations made during surgical operations have shown that the pattern of the electrical waves of the human brain gives a very sensitive index of depth of anesthesia. Apparatus suitable for use in the operating room therefore has been developed to record and display this activity (electroencephalogram) in a form most convenient for the use of the anesthetist in the monitoring of depth of anesthesia.

A further development has followed upon the observation that the electrical output of the brain decreases progressively as anesthesia deepens. This suggested the design of an electromechanical system that would automatically deliver the anesthetic agent to the patient at a rate dependent on the integrated electrical output of the brain. This servosystem has been found to maintain automatically the desired depths of anesthesia for long periods without any tendency to hunt. A recent refinement, adding considerably to the reliability of operation in the face of electrical interference, has been a limitation of the frequency response of the system to a narrow band of frequency lying outside the interference ranges.

We wish to correct an error which appeared in the November 1951 issue of the INTERNATIONAL RECORD OF MEDICINE. In the article, "Oral Nonspecific Therapy," by Howard B. Emerson, M. D., "6.25 mg." in the table on page 654 should have read "6.25 mcg."

ABSTRACTS

102. *Program for Intern Training for General Practice*. G. LOMBARD KELLY, Augusta, Ga. J.A.M.A. Georgia *40*:337-41, August 1951.

A revived interest in the disproportion between the number of specialists and the number of general practitioners within the last decade has resulted in the adoption of the two-year rotating internship with emphasis on general practice training. Related to this development is the requirement in some medical schools that students spend the summer months between the third and fourth years assisting general practitioners who serve as preceptors for them. The trend in medical education seems to be toward a longer curriculum, utilizing time previously spent for vacation periods.

A poll taken in 1950 indicated the percentage of students planning to enter general practice had increased from 36 to 47 in the last three years. The public is demanding doctors who will come to the homes when necessary; thus the advocators of "socialized medicine" will find ready followers unless the overemphasis on specialization is curbed.

Students are attracted to family practice by a well planned training program which includes responsibility in the care of patients under supervision, training in domiciliary medicine, and special courses in family practice in which the didactic lecture method and modern bedside clinic procedure are combined. A student is often discouraged by a feeling of inadequacy, which could be alleviated by employing adequate postgraduate training.

Specialization is beneficial, but general practitioners are needed to fill the gap between the patient as a person and his occasional needs for a specialist.

An integrated teaching plan, such as the one planned for the Medical College of Georgia through the facilities of the new state general hospital to be erected in 1952, would include rotation of interns and residents between the state hospital on the college campus and the various other State hospitals, rotation of faculty members, and extensive training of nurses and technicians.

This plan would: (1) increase the number of approved internships and residencies within the State, (2) provide a higher type of medical care for the inmates of the institutions, (3) provide a superior type of training that would provide more and better doctors for the state as a whole.

It is apparent that medical education is in a state of flux and by means of time-saving methods and a commonsense approach, we look forward to more rapid developments in the training of students in the art and science of medicine. 7 references.—*Author's abstract*.

103. *The Effect of Procaine Penicillin G on Experimental Traumatic Shock Induced by Unilateral Tourniquets*. L. M. LUSKY AND HERBERT A. BRAUN, Washington D. C. Antibiotics & Chemotherapy *2*:58-59, January 1952.

Shock was induced in cats by application of tourniquets to the right thigh of the

animals. The tourniquets were released after five hours. A single intramuscular dose of procaine penicillin G, 300,000 units in the left leg 2 hours and 55 minutes after release of the tourniquets, protected a large proportion (80 per cent) of cats from traumatic shock of a degree fatal to approximately 80 per cent of the untreated controls and animals treated with 300,000 units of potassium penicillin. In another series, in which shock was induced in the manner described above, a group of animals were treated intramuscularly with 138 mg. procaine hydrochloride, the equivalent of the procaine base of the above dose of procaine penicillin G, and alternate cats were treated with 300,000 units of amorphus aluminum penicillin. Both procaine hydrochloride and amorphus aluminum penicillin in single doses were without effect. Thirty per cent of the animals in each group survived, the differences between the mortality rates of these animals and those of the untreated controls is not statistically significant. 2 references.

104. *Routine Bacteriologic Sensitivity Determinations in Antibiotic Treatment.* HOWARD E. LIND AND ELLEN SWANTON, Brookline, Mass. Antibiotics & Chemotherapy *2*:30-34, January 1952.

Before sensitivity discs for any antibiotic were used to determine the sensitivity of an isolated microorganism, all had been standardized by the standard serial dilution technique. Routinely, chloromycetin, terramycin and streptomycin were employed against gram-negative organisms, and penicillin, aureomycin and terramycin against gram-positive organisms. Results of sensitivities were reported as sensitive, moderately sensitive or resistant rather than in definitive units. The presence of inhibition zone (of at least 5 mm.) by a particular disc concentration rather than actually diameter of zone determined whether an organism was sensitive or resistant. This method of reporting is less misleading than a report in terms of definitive units of sensitivity. Experience demonstrated that clinical response to a particular antibiotic was similar whether a zone of 8, 15 or 25 mm. was demonstrated (*in vitro*). The rapid information of routine sensitivity results, consistent with accuracy, is of practical significance to the physician as an aid to the course of therapy. In our hands, the determination of routine antibiotic sensitivities with commercial sensitivity discs (Difco and Boyle) can be run rapidly, accurately, and economically and provide optimum bacteriologic service to the physician and patient. 4 references, 1 table.—*Author's abstract.*

105. *The Psychological Management of Cancer Cases.* NATHAN S. KLINE, Worcester, Mass. AND JULIUS SOBIN, Newark, N. J. J.A.M.A. *146*:1547-51, Aug. 25, 1951.

Improved methods of cancer detection and public education on the subject mean that physicians are seeing and treating many more malignant lesions than ever before. Not the least of the problems is the psychologic management of these cases. Although each physician handles not only his cases in general differently, but each patient somewhat differently from any other, it is felt that a general review of the problem may be helpful and suggestive.

1. The physician should be absolutely certain of the diagnosis. Until he is certain, any action that might arouse suspicion by the patient of the nature of his illness

should be avoided. However, unless it is impressed on the patient that the condition may be serious, difficulty may arise in having him follow through with the necessary diagnostic procedures.

2. Unless there are strong indications to the contrary, it is advisable to wait until the patient asks. With the widespread knowledge of cancer symptoms, it is inevitable that those patients who want to know will eventually present the physician with this opportunity.

3. The major consideration of the physician in deciding whether to conceal from the patient the nature of his illness should be the way he manages other life situations. It will probably be better for those persons who have a realistic approach to life in general to know the truth.

4. If the patient does ask, the way he phrases his question may give a strong indication as to the type of answer he desires.

If the Patient is Told. Regardless of how stable a person may seem, the psychological shock is certain to be severe. This can be "buffered" to some extent if the truth is told in easy stages. Stress should be laid on the fact that therapy is available for even the most malignant of neoplasms.

When the physician does reach the stage at which he is ready to tell the patient definitely of the nature of his illness, he should have available and visible concrete evidence, such as the pathologic report, if possible, and x-ray report. It is important to forestall the possibility of raising false hopes or of driving the patient to charlatans and quacks, who might question the diagnosis, if it has not been conclusively enough presented. If at all feasible, at least the possibility of consultation with a colleague or a reputable specialist should be offered to the patient.

Immediate reassurance should be given to the patient as to the nature of the therapeutic program. When analgesics are used, there should be no hesitancy in their liberal application. The aim should be to prevent discomfort rather than to alleviate it.

A discussion concerning the extent of financial involvement and the means by which it can be minimized should be introduced.

Whether the family should be informed of the patient's illness and if so, how, should also be reviewed in detail with the patient. It is the physician's responsibility to advise and counsel the patient and actively suggest the course he should follow.

Unless there are strong indications to the contrary, the patient should be urged to retain his usual job as long as possible. Auxiliary activities should be introduced.

If the Patient is not Told. If it is found desirable to conceal from the patient the nature of his illness, it is usually wise to substitute some other condition. As the symptoms progress, the patient will inevitably know that something is wrong with him, and, if he is able to attribute it to some relatively benign condition, he will at least have the consolation of "understanding" the cause of his complaints.

Management of Family if they are Told. The patient should be strongly urged to bring into confidence at least one responsible member of the family, although this

need not be the nearest relative. The most desirable attitude on the part of both the family and the patient is acceptance of the fact as such, with an effort to expend the remaining time as constructively as possible. Specific suggestions are itemized at this point in the paper as to handling of patient-family relationships on the part of each.

If the Family is not to be Told. Unless it is specifically requested, it is probably preferable not to volunteer any information as to the patient's condition.

If no one in the family is found to be responsible enough, either emotionally or otherwise, to be told the plain facts of the case, it is wise for the physician to protect himself by having a colleague called in as consultant.

If the patient is considered inoperable, the relative value of hospitalization in relation to benefits to be obtained should be discussed with the patient, if he is told, or the responsible member of the family if the patient is not told.

The patient may resort to visiting a great number of other physicians. This provides a hope of escape and the physician should anticipate this by suggesting other consultants. Visiting large numbers of physicians may at least provide activity that, although fruitless, may alleviate the pressure.

Flight from the Disease. At times patients will become actively psychotic and lose touch completely with reality. The management of patients of this type is naturally for the psychiatrist. Other patients will develop compensatory outlets, the most frequent of which is turning to "religion." The intensity of previous religious beliefs may be increased, or there may be a devoted adherence or belief in the importance of almost any "cause" or theory.

Another form of flight from the disease is suicide. It is the physicians' responsibility to guard against this. It is important to note a sudden, complete acceptance of the situation following prior difficulty in adjustment, history of depression earlier in the patient's life, and insomnia, depressed posture, and anorexia, occurring without adequate organic basis. Occasionally, a patient will respond with euphoria. This should always be regarded as a compensatory type of reaction covering a severe depression. The euphoric patient is often a greater suicidal risk than one who is openly depressed.

Overreaction to the Disease. At times, knowledge of a chronic fatal illness may result in complete physical collapse, and hospitalization becomes necessary, not so much for the treatment of the chronic illness as for building the patient up to some sort of functional level.

Obsessive Preoccupation with the Disease. That a patient with this condition will dwell on it to some extent is to be expected. In cases in which the patient's preoccupation becomes so severe that he makes life intolerable for both himself and his family, serious consideration should be given to one of the psychosurgical procedures. Other techniques, such as hypnosis and intensive psychotherapy, are valuable in some cases.

book reviews

Penicillin Decade, 1941-1951, Sensitizations and Toxicities. LAWRENCE WELD SMITH, M.D., AND ANN DOLAN WALKER, R.N. Arundel Press, Inc., 1951. Price $2.50.

This monograph on sensitizations and toxicities presents the principal data on the untoward effects of penicillin therapy. The authors observe a steady increase in resistance of staphylococcus to penicillin despite increased dosage. Fortunately, other antibiotics are available to circumvent this difficulty. They find that reactions to penicillin are essentially pyogenic due to impurities in amorphous forms of penicillin. With penicillin G, the reaction rate fell off sharply, but the reaction rate reappeared with the advent of procaine penicillin. Unfortunately, this sensitization is not a simple histaminic response. A word of warning is appropriate regarding the indiscriminate use of penicillin or antibiotics. They are only of value in treatment of organisms sensitive to the antibiotics used. The actual toxicity of penicillin is negligible, but its ability to sensitize and cause serious and even fatal accidents should not be minimized.—*I. Newton Kugelmass.*

International Society of Hematology. Proceedings of the Third International Congress, Cambridge, England, August 1950. New York, Grune & Stratton, 1951.

Contributions of the participants in this Congress on Hematology cover a variety of blood disorders, i.e., anemias, immunohematology, leukemias and blood clotting disturbances. Some of the papers are given completely while others are in abstract form. The wide variety of hematological material makes this an invaluable summary of the contributions of the dacade.—*I. Newton Kugelmass.*

International Pharmacopoeia, Vol. I. Geneva, World Health Organization, 1951, 406 pages. Price $5.00.

The first volume of the first *International Pharmacopoeia* setting uniform standards for important drugs was published on October 30 by the World Health Organization in Geneva.

The book was prepared upon the recommendations of 79 member states by the World Health Assembly. It contains descriptions of 200 important drugs defined by chemical, physical and biological tests and is expected to bring uniformity in standards for drugs utilized throughout the world.

Up to date, a majority of countries have used different national pharmacopoeias produced independently in accordance with the special needs of medical practice in each country. These books, which lay down the official drug standards for particular countries, are often called "the pharmacist's bible."

The new *International Pharmacopoeia* which sets down internationally approved standards is expected to help the spread of medical knowledge, to further economy in production of drugs, and to facilitate their trade.

The first volume also contains 43 appendices containing instructions for establishing purity and strength of drugs. The names of drugs are given in Latin, the traditional language of medicine and pharmacy. Their adoption will prevent confusion arising from the use of different names for the same drug.

The second volume of the pharmacopoeia is now under preparation. It will deal with such drugs as penicillin, streptomycin and other antibiotics, and will contain specifications for the administration of drugs by injection and in tablet form. An expert committee of the World Health Organization is now meeting in Geneva under the chairmanship of Dr. C. H. Hampshire of London to prepare the second volume.

The first volume is now available in English and French. A Spanish edition will be published in the near future.

Diabetes Control. EDWARD L. BORTZ, M.D. Philadelphia, Lea & Febiger, 1951. 264 pages. Price $3.50.

This manual is especially recommended to every diabetic patient and to all who might be susceptable to diabetes as a result of age, obesity, racial tendencies, common infections, nervous and emotional states, or other contributing factors. There are now more than one million known diabetics in this country. Dr. Bortz gives full consideration to the important part played by food, as well as insulin and other measures, in diabetes control. There is a chapter on Meal Planning, with numerous menus, lists of food values and other useful information. Obesity and malnutrition are discussed at length in the chapter on Weight Control, with special diets and corrective exercises. The new carbohydrate values accepted by the American Diebetes Association, the American Dietetic Association, and the U. S. Public Health Service are followed throughout.

Dr. Bortz tells what diabetes is, what causes it, how it is controlled, and symptoms to watch for in every member of your family. He outlines the many precautions necessary to prevent complications, gives authoritative advice to pregnant women suffering from diabetes, and explains the causes and prevention of diabetic coma. Full attention is given to the psychologic aspects. Treatment by insulin includes emphasis on the standard, protomine zinc, crystalline zinc, globin and the new NPH insulin. Modern views on methods of administration, time, quantity and technic are detailed. A special feature is a section containing 75 questions and answers on subjects pertinent to diabetes control.

Antibiotic Therapy. HENRY WELCH, PH.D., CHARLES LEWIS, M.D., AND CHESTER S. KEEFER, M.D. The Arundel Press, Inc., 1951. Price $10.00.

The advances in the treatment of infectious diseases during the past fifteen years are due in the main to the introduction of the sulfonamides and the antibiotics. For several years after the sulfonamides were introduced, attention was centered on this potent group of chemicals, so that within a few years a large number of sulfonamides became available for general use. With the introduction of tyrothricin for

the treatment of local and superficial infections and of penicillin for the treatment of systemic infections, the pendulum swung in the other direction, so that the anti-infective agents of microbial origin, the so-called antibiotics, commanded attention. Within the past 10 years, penicillin, streptomycin, bacitracin, aureomycin, chloramphenicol, and terramycin have been developed for general use, and a number of others have been isolated and tested in experimental animals.

As a result of the discovery, production and clinical application of these antibiotics in man, a mass of information concerning their properties and fields of usefulness has accumulated. Problems of selection, dosage, absorption and excretion, and side effects are all important. In this book, the authors have brought together a large amount of information concerning the antibiotics in common use and they have presented it in a way that is useful to the physician who wants a summary of these antibiotics.

The book gives a biographical sketch of the discoverers of the various antibiotics. One part deals with the isolation and development of the antibiotics. The second part with a detailed discussion of each antibiotic, including antimicrobial spectrum, pharmacology, and dosage forms. The third and last part is devoted to a discussion of the treatment of specific diseases and an attempt is made to sum up the experience and results of the use of a variety of antibiotics in individual diseases. At the end of each chapter, there is a selected bibliography.—*I. Newton Kugelmass.*

Premature Infants, A Manual for Physicians. ETHEL C. DUNHAM, M.D., published by Federal Security Agency, Social Security Administration, Children's Bureau, 1948.

Of the 3,000,000 births that occurred in the United States in 1944, approximately 150,000 (5 per cent) may be conservatively estimated to have been premature. The death rate among premature infants is high and the cause of death is often obscure. It is known that the less the infant weighs at birth the less is the chance of survival. Prolongation of pregnancy to as near term as possible by all means consistent with the welfare of the mother, as well as the infant, is the best method of reducing mortality from premature birth. After birth the premature infant requires special care by physicians and nurses with knowledge of the best methods of care and skill in applying them. Studies have shown that the physical and mental development of these infants, provided they have not received a cerebral injury during birth, compares favorably with the development of full-term infants.

Part I deals with general considerations—definition of and criteria for prematurity; incidence, causes, and prevention of premature birth; death rates and causes of death; and the growth and development of premature infants. Material from a wide variety of sources, with references for the convenience of those interested in more detailed study, has been brought together in compact form with a view to orienting the reader and providing a background for the clinical material.

Part II deals with the physiologic handicaps of premature infants; the general problems of their care; and the congenital and acquired conditions that tend to affect them adversely.—*I. Newton Kugelmass.*

Simmonds' Disease, Extreme Insufficiency of the Adenohypophysis. R. F. FARQUHARSON, M.B., F.R.C.P., Toronto General Hospital, Toronto, Canada. Charles C. Thomas, 1950.

This monograph on Simmonds' disease presents the pathologic and clinical picture of the syndrome of extreme insufficiency of the adenohypophysis. The discussion is based on examination of published reports of cases of this syndrome, subjected to postmortem examination. While this limits available material, it enables a more dependable evaluation of conflicting aspects of this group of diseases. After describing the first cases, the author proceeds to discuss the pathogenesis and pathologic aspects of the various lesions that may disturb the adenohypophysis. Great stress is laid on the secondary pathologic changes. Finally, the clinical picture is described in great detail in relation to the pituitary syndromes. Actually, the condition is not a specific disease, but a highly characteristic state of total insufficiency of the adenohypophysis caused by a variety of destructive lesions. The syndrome is, however, so definite and characteristic that it warrants the continued use of a distinctive name. The complete list of references attests to the prevalence of the condition.—*I. Newton Kugelmass.*

news

AERO MEDICAL ASSOCIATION—23RD ANNUAL MEETING

The Aero Medical Association will bring the attention of the aviation medical world to Washington, D. C., during the Twenty-Third Annual International Meeting of the Association. Major General Harry G. Armstrong, USAF Surgeon General, President of the Association, will preside at the sessions to be held at the Statler Hotel, March 17-19, 1952. Scheduled to attend and participate in the meeting for the first time are leading aviation medicine representatives from twenty nations, including Yugoslavia, Italy, Belgium, Denmark, Norway, and Sweden.

A full program of scientific papers, exhibits, and demonstrations will delineate many of the latest trends and developments in the field of aviation medicine. The Space Medicine Group of the Association has scheduled a series of discussions in their specialized field of research.

The oldest and largest society in the world devoted to the advancement of the art and practice of aviation medicine, the Aero Medical Association, held its first meeting twenty-two years ago in Detroit, Michigan. The small group of physicians who were then pioneering in a new medical specialty has grown through the years to an Association which now embraces in its membership authorities and practitioners in aviation medicine from nearly every part of the world.

International Record of Medicine

VOLUME 164

and

General Practice Clinics

VOLUME 8

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VOLUME 164

Cumulative Subject Index

ACTH
—why cortisone and ACTH aid allergy and infection, relation to cortical hypoadrenia, 240

ADRENAL GLANDS
cortex—See Hypoadrenia, cortical.

ADRENOCORTICOTHERAPY
—effect of oral administration of certain streptomyces fermentation products on "hemolytic" anemias with notes on certain similarities between the effects of intestinal flora reversion and those of adrenocorticotherapy, 117

ALLERGY
—why cortisone and ACTH aid allergy and infection, relation to cortical hypoadrenia, 240

ALPHA TOCOPHEROL—*See Vitamin E.*

ANEMIA
hemolytic:
—effect of oral administration of certain streptomyces fermentation products on "hemolytic" anemias with notes on certain similarities between the effects of intestinal flora reversion and those of adrenocorticotherapy, 117

ANNOUNCEMENTS
—Hebrew Medical Journal, 24th anniversary number, 239
—Robins introduces new form of Pabulate, 366

ANTIHISTAMINES
—effect of an antihistaminic drug (neohetera-mine) on a long dormant seizure case, 681

ARTERIES
diseases:
—alpha tocopherol (vitamin E) in obliterative arterial disease, 353

ARTHRITIS
—five year summary of x-ray therapy of arthritis, bursitis and radiculitis, 62
rheumatoid:
—gold therapy versus hormone therapy in the treatment of rheumatoid arthritis, 237

AUREOMYCIN
—aureomycin in acute infectious mononucleosis, 177
—mucocutaneous-ocular syndrome, report on a case treated with aureomycin, 469

BLOOD
diseases:
—clinical experiences and opinions in the field of hematology, 482

BLOOD PRESSURE
—effect of a diet of vegetable foods on the blood pressure, 79

BURSITIS
—five year summary of x-ray therapy of arthritis, bursitis and radiculitis, 62

CANCER
—carcinogenesis in the light of the trophoblastic or unitarian thesis of cancer, 141
—general practitioner and cancer, 299

CARCINOGENESIS—*See Cancer.*

CEREBRAL PALSY
—clinical aspects of cerebral palsy, life history of the disease, 300
—role of pharmacotherapy in abnormal muscular states and abnormal movements in patients with cerebral palsy, 367

CHEMOTHERAPY
chemotherapy of tuberculosis, 1

COLDS
—the common cold, 417

COLPOCYTOGRAM
—agreement of clinical diagnosis with vaginal smears as shown by the evaluation of symptoms, colpocytogram and glycogen index, 13

CORTISONE
—cortisone therapy without undesirable physiologic side effects and the Pronor-Cortone compound, an experimental investigation of three cases, 689
—why cortisone and ACTH aid allergy and infection, relation to cortical hypoadrenia, 240

DICHOMATOUS QUANTITATIVE DIFFERENTIATION
—dichomatous quantitative differentiation (D QD) of hematosonographs of psychotics and nonpsychotics, 633

DIET
—effect of a diet of vegetable foods on the blood pressure, 79

EGO
—clinical assessment of ego strength, 687

EPILEPSY
—effect of an antihistaminic drug (neohetera-mine) on a long dormant seizure case, 681
—epilepsy as a mental hygiene problem, 465

ERYTHEMA MULTIFORME
—mucocutaneous-ocular syndrome, report on a case treated with aureomycin, 469

FREUD
—meaning of Freud for our time, 249

GASTRODUODENAL ULCER
perforation:
—fallacy of routinely treating all perforated gastroduodenal ulcers by nonsurgical methods, 295

GIRLS
—nature and changes of the body schema of girls nine, ten and eleven years old with special reference to age, body type, and height, 558

GROUP THERAPY
—experiences in group psychotherapy with the obese, 566
GROWTH
—nature and changes of the body schema of girls nine, ten and eleven years old with special reference to age, body type, and height, 558
HEMATOLOGY
—clinical experiences and opinions in the field of hematology, 482
HEMATOSONOGRAPHS
—dichomatous quantitative differentiation (D QD) of hematosonographs of psychotics and nonpsychotics, 633
HISTAMINE
—histamine in mental disorders, 358
HORMONES
—gold therapy versus hormone therapy in the treatment of rheumatoid arthritis, 237
HYDROTHERAPY
—hydrotherapy in neurological and vascular problems, 553
HYPOADRENIA
cortical:
—why cortisone and ACTH aid allergy and infection, relation to cortical hypoadrenia, 240
INDUSTRIAL MEDICINE
—occupational injury, 179
INFECTION
—chronic infection and the non-specific reaction, 130
—why cortisone and ACTH aid allergy and infection, relation to cortical hypoadrenia, 240
INJURIES
occupational:
—occupational injury, 179
MARRIAGE
—doctor as marital counselor, 472
MONONUCLEOSIS
infectious:
—aureomycin in acute infectious mononucleosis, 177
—chronic infectious mononucleosis, report of five cases, 258
MUCOCUTANEOUS-OCULAR SYNDROME—*See Erythema Multiforme.*
MULTIPLE SCLEROSIS
—seasonal variations in multiple sclerosis, 8
MUSCLES
disorders:
—role of pharmacotherapy in abnormal muscular states and abnormal movements in cerebral palsy, 367
NERVOUS SYSTEM
diseases:
—hydrotherapy in neurological and vascular problems, 553
OBESITY
—experiences in group psychotherapy with the obese, 566
—obese character, psychodynamics and psychotherapy as an adjunct to medical management, 24
ORAL THERAPY
—oral nonspecific therapy, 651
PANGAMIC ACID SODIUM
—pangamic acid sodium, a newly isolated crystalline water-soluble factor, a preliminary report, 18
PHYSICIANS
—doctor as marital counselor, 472
PREGNANCY
toxemia:
—clinical pathological conference on a case, 423
PRONOR-CORTONE
—cortisone therapy without undesirable physiologic side effects and the Pronor-Cortone compound, an experimental investigation of three cases, 639
PSYCHIATRY
—recent developments in treatments in psychiatry, 69
PSYCHOSES
—dichomatores quantitative differentiation (D QD) of psychotics and nonpsychotics, 633
—histamine in mental disorders, 358
PSYCHOTHERAPY
—clinical ussessment of ego strength, 687
group—See Group Therapy
RADICULITIS
—five year summary of x-ray therapy of arthritis, bursitis and radiculitis, 62
RADIUM
—radium and radon therapy, an evaluation of this form of therapy based upon an experience of 27 years in the treatment of benign and malignant disease in a large municipal general hospital, 409
RADON
—radium and radon therapy, an evaluation of this form of therapy based upon an experience of 27 years in the treatment of benign and malignant disease in a large municipal general hospital, 409
ROENTGEN THERAPY
—five year summary of x-ray therapy of arthritis, bursitis and radiculitis, 62
STREPTOMYCES
—effect of oral administration of certain streptomyces fermentation products on "hemolytic" anemias with notes on certain similarities between the effects of intestinal floral reversion and adrenocorticotherapy, 117
THERAPEUTICS
—oral nonspecific therapy, 651
TUBERCULOSIS
—chemotherapy of tuberculosis, 1
ULTRASOUND—*See also Hematosonographs.*
—instrumentation of ultrasound for biologic quantitation, 612
—ultrasonometry, a new modality in biology and medicine, 617

GLYCOGEN INDEX
—agreement of clinical diagnosis with vaginal smears as shown by the evaluation of symptoms, colpocytogram, and glycogen index, 13
GOLD THERAPY
—gold therapy versus hormone therapy in the treatment of rheumatoid arthritis, 237
VAGINAL SMEAR
—agreement of clinical diagnosis with vaginal smears as shown by the evaluation of symptoms, colpocytogram and glycogen index, 13
VASCULAR SYSTEM
diseases:
—hydrotherapy in neurological and vascular problems, 553
VITAMIN E
—alpha tocopherol (vitamin E) in obliterative arterial disease, 353
X-RAYS—*See Roentgen Therapy*

Cumulative Author Index

A
Ashe, William F., 179

B
Baird, K. A., 417
Barnard, Robert D., 117
Bartlett, Clifford L., 18
Beard, Howard H., 18
Blair, William M., 681
Blazer, Alfred, 24
Brown, Edward E., 240

C
Cecil, Russell L., 237
Christensen, Ernest C., 79
Christenson, James A., 687
Cole Schroeder, Marion, 423
Collins, Donald C., 295
Co Tui, 612, 617, 633
Crowthers, Bronson, 300

D
Dieckmann, William, J., 423

E
Emerson, Howard B., Jr., 130, 651
Erf, L. A., 482

G
Gant, Ola K., 79
Gelber, Louis J., 62
Gordon, Alfred, 465
Green, John W., Jr., 423
Gunvald, Gori, 558

H
Harris, Arthur T., 18
Hudgins, Archibald Perron, 472

I
Ibanez, Felix Marti, 612, 617, 633, 700
Isenstead, Joseph H., 689

K
Kaplan, Ira I., 409
Katzenelbogen, Solomon, 59
Kaufmann, Paul E., 358
Kotkov, Benjamin, 566
Krebs, Ernst T., Jr., 18, 141
Krebs, Ernst T., Sr., 18

L
Lang, R., 469

M
Malin, Reba, 18
Mittleman, M. B., 633
Mittlemann, M. D., 617

N
Nellen, Maurice, 469

O
Overholser, Winfred, 249

R
Rich, Stanley, 612
Rickman, E. E., 8
Roth, Wilfred, 612

S
Sackler, Arthur M., 612, 617, 633
Sackler, Mortimer D., 612, 617, 633
Sackler, Raymond R., 612, 617, 633
Schwartz, Ferdinand F., 553
Seiler, Hawley H., 1

T
Trueblood, Donald V., 299

U
Unna, Klaus R., 367

V
Vaisberg, Maurice, 177, 258
Villaverde, Manual M., 13
Vogelsang, Arthur, 353

W
Williams, E. Y., 8

GENERAL PRACTICE CLINICS

VOLUME 8

Cumulative Subject Index

ABDOMEN
acute conditions:
—acute surgical emergencies in the abdomen in pregnancy, 436
pain:
—acute abdominal pain, some medical causes, 35
surgery:
—liver dysfunction following abdominal operations, significance of postoperative hyperbilirubinemia, 217
wounds:
—obstetrical approach to abdominal war wounds in late pregnancy, 401
ACCUSED
—examination of the accused in Massachusetts (1921-1949), 99
ACHLORHYDRIA
—intestinal transit time in achlorhydria, 462
ACTH
—effect of ACTH on acute rheumatic carditis, 586
—effects of adrenocorticotropic hormone in pneumonia, clinical, bacteriological and serological studies, 93, 403
—oreton and ACTH found to improve vision and general physical condition among relatively young cataract patients suffering from glandular deficiencies, 497
—pituitary adrenocorticotropic hormone (ACTH) and cortisone in diseases of the skin, 736
ADRENAL GLANDS
cortex:
—epinephrine test for cortico-adrenal reserve function and the excretion of corticosteroids and 17-ketosteroids in chronic ulcerative colitis, 282
—role of epinephrine in the secretion of the adrenal cortex, 94
ADRENOCORTICOTROPIC HORMONE—*See ACTH*
AEROSOLS
—aerosol penicillin therapy for infants and children, 38

—aerosol therapy in gynecologic infections, 745
ALBUMIN
—albumin as a stabilizer of cholesterol sols, 588
ALCOHOLISM
—biochemical methods in the treatment of alcoholism, with special reference to Antabuse, 459
—experience with antabuse treatment of alcoholism in a general hospital, 103
—problem of the alcoholic, 385
—study of results in hospital treatment of alcoholism in males, 90
ALLERGY
—food allergy, 461
—gastro-intestinal and food allergy, 585
—nutritional therapy in the management of respiratory anaphylaxis or allergies, 33
AMEBIASIS
—aureomycin in intestinal amebiasis, a preliminary report, 339
—aureomycin and terramycin in acute intestinal amebiasis, 726
—preliminary remarks on the treatment of acute intestinal amebiasis with terramycin, 725
—treatment of amebiasis, with a preliminary report on the use of aureomycin, 339
AMINO ACIDS
—β = aminoisobutyric acid, a new amino acid obtained from human urine, 604
AMPHETAMINE—*See Benzedrine.*
AMYOTROPHIC LATERAL SCLEROSIS
—amyotrophic lateral sclerosis observed in 5 persons after gastric resection, 96
ANAPHYLAXIS
—effect of cortisone upon the experimental cardiovascular and renal lesions produced by anaphylactic hypersensitivity, 406
ANEMIA
—anemia of infection, response to massive doses of intravenously administered saccharated oxide of iron, 89
in cancer:
—anemia of cancer patients and its relation to metastases to the bone marrow, 598
hemolytic:
—erythrocyte survival studies in childhood, unusual familial hemolytic anemias associated with intrinsic erythrocyte abnormality, 318
—studies of hemagglutinins in hereditary spherocytosis and in acquired hemolytic anemia, their relationship to the hypersplenic mechanism, 596
Mediterranean:
—erythrocyte survival studies in childhood, studies in Mediterranean anemia, 317
pernicious:
—effect of vitamin B_{12} in pernicious anemia and subacute degeneration of the cord, 732
ANESTHESIA
—anesthesia for the general practitioner, 748
—evolution of the use of curare in anesthesiology, 720
—resumé of anesthetic experience in 1037 intrathoracic operations, 392
—use of WIN 2747 in anesthesiology, 722
obstetric—See Obstetrics, anesthesia.
spinal:
—paralysis of extraocular muscles following spinal anesthesia, 269
—sixth-nerve palsy occurring after lumbar puncture and spinal analgesia, 510
ANEURYSM
—aneurysm of the splenic artery, 442
ANGER
—mood, anger and somatic dysfunction, 498
ANGINA PECTORIS
—effort test in angina pectoris, 343
ANNOUNCEMENT
—cancer terminology standardized by American Cancer Society, 608
ANOXIA
—anoxia as a cause of fetal death and congenital defects in the mouse, 228
ANTABUSE
—biochemical methods in the treatment of alcoholism, with special reference to Antabuse, 459
—experiences with antabuse treatment of alcoholism in a general hospital, 103
ANTACIDS
—antacids and aureomycin, 404
—peptic ulcer in man, a new antacid made to meet requirements of antacid therapy, chemical and laboratory work, 405
ANTIBIOTICS
—antibiotics in dermatology, 734
—clinical symposium on present day use of antibacterial and chemotherapeutic agents, the drug of choice, 592
—in vitro sensitivity to eight antibiotics of streptococci and staphylococci recovered from cases of bacterial endocarditis, 449
—Maginot line of otology, dependence on antibiotics in suppurative middle ear disease, facts and fancies, 52
—present status of antibiotic and chemotherapeutic agents in surgery, 393
—present status of antibiotics and other agents for the treatment of urinary infections, 321
—studies on the synergistic action of antibiotics and sulfonamides in the treatment of gonorrhea in males, 726
combinations of:
—bacteriological studies of the newer antibiotics, effect of combined drugs on microorganisms, 533
new:
—new antibiotics in the treatment of tuberculosis, 727
ANTICOAGULANTS
—experience with a new anticoagulant, 444
—some remarks on retinal vein thrombosis and its treatment with anticoagulants, 312
ANTI-CURARE DRUGS—*See Drugs, anti-curare*
ANTIHISTAMINES
—antihistamines in dysmenorrhea, 746
—prophylaxis and treatment of acute respira-

tory diseases with antihistaminic drugs, I-IV, 50-51
AORTA
abdominal:
—insidious thrombosis of the abdominal aorta with hypercholesterolemia, 290
APPENDECTOMY
—dangers of the tie and drop method of appendectomy, 396
APPENDICITIS
—new method in the early diagnosis of acute appendicitis in the absence of localization, 396
complications:
—dangerous masking effect of penicillin in acute perforative appendicitis with secondary peritonitis, 441
APPENDIX
—function of the appendix, 438
ARTERIES
stenosis:
Singer's treatment of stenosing processes of arteries, 94
ARTHRITIS
—arthritis as related to gastroenterology, 404
ASCITES
—observations on portal cirrhosis with ascites, 731
ASTHMA—*See also Status Asthmaticus*.
cardiac:
—clinical aspects of cardiac asthma and acute pulmonary edema with special reference to blood pressure, 458
ASTIGMOMETER
—simplified astigmometer, 308
ATHEROMA
—pathogenesis of atheroma, with special reference to disordered lipoid metabolism, 292
ATROPINE
—atropine as a pressure-reducing agent in juvenile glaucoma, 314
AUREOMYCIN
—antacids and aureomycin, 404
—aureomycin and terramycin in acute intestinal amebiasis, 726
—aureomycin in intestinal amebiasis, a preliminary report, 339
—first results with aureomycin in infections in infants, 39
—granuloma inguinale and its treatment with oral aureomycin, 42, 218
—therapeutic results with aureomycin and chloramphenicol, 319
—treatment of amebiasis with a preliminary report on the use of aureomycin, 339
—use of aureomycin and chloramphenicol in the treatment of trachoma, 491
local application:
—topical aureomycin (oily suspension) in ophthalmology, first reports on 47 cases, 490
rectal administration:
—failure of absorption of aureomycin and terramycin administered as a retention enema, 337
AURICLES
septum:
—physiological studies in congenital heart disease, comparison of the right and left auricular, capillary and pulmonary artery pressures in nine patients with auricular septal defect, 284, 581
BACILLUS PYOCYANEUS—*See Pseudomonas aeruginosa*.
BACITRACIN
—treatment of pneumonia with bacitracin, 727
BACK PAIN
—back pain role of prostate and urethral disease, 48
—diagnosis and non-operative treatment of low back pain, 55
—headache related to low back pain, 389
BASAL METABOLISM
—source of error in the determination of basal metabolic rates by the closed circuit technic, 452
BASE COAT
—"base coat" nail disease, 97
BENEMID
—benemid and carinamide, comparison of effect on para-amino-salicylic acid (PAS) plasma concentration, 329
—effect of benemid on plasma penicillin levels, 582
BENZEDRINE
—effective treatment of obesity, Benzedrine (amphetamine), 347
BILHARZIASIS
—recent advances in the treatment of bilharziasis, 340
BIOPSY
—early diagnosis of cancer, the biopsy, 431
BLADDER
tumors:
—spontaneous disappearance or regression of bladder neoplasm, review of the literature and report of three cases, 446
BLINDNESS
—battle against blindness, 742
BLOOD
cells—*See Erythrocytes, Leukocytes, Lymphocytes*.
chemistry:
—concentration of cholesterol in the blood serum of normal man and its relation to age, 34
oxygen:
—femoral venous blood oxygen studies upon normal and abnormal subjects at rest and after exercise, 730
BLOOD PRESSURE
—arterial tension and EKG in the period of climacterium in women, 382
—clinical aspects of cardiac asthma and acute pulmonary edema with special reference to blood pressure, 458
high—*See Hypertension*.
BLOOD SUGAR
—significance of arterial blood sugar in spontaneous hypoglycemia, 452
BOOK REVIEWS
—adoption laws in Latin America, 235
—child psychiatry in the community, a pri-

mer for teachers, nurses, and others who care for children, 234
—chloroform, a study after 100 years, 152
—effect of hormone upon the testes and accessory sex organs, 752
—elements of psychoanalysis, 606
—hemolysis and related phenomena, 234
—management of obstetric difficulties, 116
—manual of allergy for the patient, 175
—manual of tumor nomenclature and coding, 754
—mental tests in clinics for children, 606
—Merck manual of diagnosis and therapy, 174
—methodologies and techniques for the study of animal societies, 235
—origin of medical terms, 57
—peptic ulcer, 463
—postgraduate medicine and surgery, Gastroenterology, 605
—principles of public health education, 607
—problems of infancy and childhood. Transactions of the third conference, March 1949, New York, 754
—problems of infancy and childhood. Transactions of the fourth conference, March 1950, 754
—proceedings of the first conference on electrokymography, 753
—regional dermatologic diagnosis. A practical system of dermatology for the non-specialist, 464
—renal function. Transactions of the first conference, 754
—saints, sinners and psychiatry, 463
—Saw-Ge-Mah (medicine man), 116
—scientific, medical and technical books, (1945-48), 605
—sex without fear, 605
—sexual deviations, 56
—sources of love and fear, 753
—spatial vector electrocardiography, clinical electrocardiographic interpretation, 751
—stress, a treatise based on the concepts of the general adaptation syndrome and the diseases of adaptation, 606
—textbook of endocrinology, 174
—textbook of pathology, pathologic anatomy in relation to the causes, pathogenesis and clinical manifestations of disease, 607
—therapeutics of internal medicine, 175
—therapy of dermatologic disorders, including a guide to diagnosis and a dermatologic pharmacopeia, 751
—year book of pediatrics, 464

BRAIN
abscess:
—brain abscess and congenital heart disease, 344
metabolism:
—influence of the thyroid on cerebral metabolism, 511

BREAD
—better bread as a source of protein and calcium for the aged, 460

BREAST
tumors:
—benign tumefactions of the breast, 435

BRONCHIECTASIS
—bronchiectasis, rehabilitation with surgical treatment, 583

BRONCHOGRAPHY
—bronchography in pulmonary tuberculosis, 434

BONE MARROW
—anemia of cancer patients and its relation to metastases to the bone marrow, 598

BONES
tumors:
—studies of radiogallium as a diagnostic agent in bone tumors, 595

BUNDLE BRANCH BLOCK—*See Heart, block.*

BURNS
—immediate supportive treatment of the severely burned patient, 47

CANCER
—clinical methods in the cytologic diagnosis of tumor, 46
—conduct of the internist toward the patient and his family when a diagnosis of malignancy is established, 587
—early diagnosis of cancer, the biopsy, 431
anemia in:
—anemia of cancer patients and its relation to metastases to the bone marrow, 598

CARBOHYDRATES
—carbohydrate utilization in surgical patients, the blood lactic acid in pre- and postoperative patients after the administration of glucose, 43

CARDIAC CATHETERIZATION
—cardiac catheterization in the diagnosis of congenital heart disease, 407

CARDIOVASCULAR SYSTEM
—appraisal of cardiovascular status in infancy by physical examination, 454
diseases:
—nutritional aspects of certain cardiovascular disorders including those occurring in diabetics, 589

CARINAMIDE
—benemid and carinamide, comparison of effect on para-aminosalicylic acid (PAS) plasma concentration, 329

CARRION'S DISEASE
—Carrion's disease treated with Chloromycetin, 448

CATARACT
—medical treatment of cataract, 493
—oreton and ACTH found to improve vision and general physical condition among relatively young cataract patients suffering from glandular deficiencies, 497
—ultra short-wave therapy in the postoperative (extracapsular) treatment of cataract, 493

CATHETERS
—new clamp for use with a bag catheter, 447

CHANCROID
—antichancroidal drugs tested by the heteroinoculation of bubo fluid from the treated donor, 334

CHEMOTHERAPY
—clinical symposium on present day use of antibacterial and chemotherapeutic agents, the drug of choice, 592
—present status of antibiotic and chemothera-

peutic agents in surgery, 393
CHIASM
optic:
—post-traumatic chiasm syndrome with intracranial pneumatocele, 508
CHICKENPOX
—chickenpox in the cornea, 271
—pre-eruptive neurological complications of the common contagious diseases, rubella, rubeola, roseola, and varicella, 265
CHILDREN
—acute form of Gaucher's disease in three children in one family, 264
—aerosol-penicillin therapy for infants and children, 38
—annual increment norms for ten measures of physical growth on children four to eight years of age, 219, 323
—body size norms for children four to eight years of age, 317
—erythrocyte survival studies in childhood, methods and general observations, 317
—hepatitis with jaundice in children, morphologic investigations, 261
—obstruction of the lower portion of the urinary tract in infants and young children, 170
—otitis media acuta in children 0 - 3 years of age, 227
—sudden death during childhood with xanthomata, 105
—surgical lesions of the chest in children, 750
anemia:
—erythrocyte survival studies in childhood, studies in Mediterranean anemia, 317
—erythrocyte survival studies in childhood, unusual familial hemolytic anemias associated with intrinsic erythrocyte abnormality, 318
tuberculosis:
—diagnosis and treatment of tuberculous meningitis in children, 222
—hemoptysis in juvenile tuberculosis, 260
—natural history and pathogenesis of miliary and meningeal tuberculosis in children, 322
tumors:
—analysis of all tumors at Children's Hospital over a ten-year period, 750
—epidermoid carcinoma of the larynx occurring in two children with papilloma of the larynx, 51
vision:
—changes in visual skills of school children following summer vacation, 741
CHLORAMPHENICOL
—problem of recurrences in typhoid and paratyphoid fever treated with chloramphenicol, 337
—therapeutic results with aureomycin and chloramphenicol, 319
—treatment of typhoid osteomyelitis with chloramphenicol, 336
—use of aureomycin and chloramphenicol in the treatment of trachoma, 491
resistance to:
—chloramphenicol-fastness, development in vivo and experimental production in vitro, 334
CHLOROMYCETIN
—Carrion's disease treated with Chloromycetin, 448
CHOLESTEROL—*See also Hypercholesterolemia*
—albumin as a stabilizer of cholesterol sols, 588
—concentration of cholesterol in the blood serum of normal man and its relation to age, 34
CHONDODENDRON TOMENTOSIUM
—isolation and identification of additional physiologically active alkaloids in extracts of chondodendron tomentosium Ruiz and Pavon, 712
CHOREA
—cortisone in Sydenham's chorea, 604
CHOROIDITIS
—about anterior choroiditis in chronic uveitis, 274
CITRATES
—citrate tolerance, 432
CIVIL DEFENSE
—psychiatric aspects of civil defense, 504
CLEFT PALATE
—changing philosophies in cleft palate management, 219, 320
CLIMACTERIC—*See Menopause.*
COLDS
—prophylaxis and treatment of acute respiratory diseases with antihistaminic drugs, I - IV, 50-51
COLITIS
ulcerative:
—chemotherapy in chronic ulcerative colitis, 453
—epinephrine test for cortico-adrenal reserve function and the excretion of corticosteroids and 17-ketosteroids in chronic ulcerative colitis, 282
—medical and modern surgical treatment of chronic ulcerative colitis, 400
—psychosomatic study of ulcerative colitis, 501
COLOR BLINDNESS
—electrophysiological studies of color-blindness, 275
COMPENAMINE—*See Penicillin, new preparation.*
CONCEPTION—*See also Contraception.*
—control of contraception in cross-cultural perspective, 663
CONJUNCTIVITIS
—gantrisin in the treatment of conjunctivitis, a clinical evaluation, 488
CONTRACEPTION—*See also Parenthood, planned*
—clinical experience with a new gel-alone method of contraception, 675
—critical study of methods of measuring spermicidal action, 673
—medical and medico-social indications for contraception, 666
—method of contraception without diaphragm, 674
CONVALESCENCE
—home care for the convalescent and the elderly, 594

CONVERGENCE
—comparison of clinical methods of measuring accomodative-convergence, 268
—orthoptic training in convergence deficiency uncovers latent vertical imbalance, 269
CONVULSIONS
—effect of generalized convulsions on the blood histamine in man, 345
treatment:
—anticonvulsive properties of desoxycorticosterone, 601
CORNEA
—chickenpox in the cornea, 271
diseases:
—use of hyaluronidase in same corneal affections, 232
opacities:
—case of primary band-shaped opacity of the cornea, 272
surgery:
—new electro-motor cornea-trephine for keratoplasty, 496
transplantation:
—corneal transplantation, 270
—influence of donor-recipient sensitization on corneal grafts, 273
CORONARY ARTERIES
—appraisal of the psychological relationship of coronary disease to peptic ulcer, 386
—electrocardiographic studies in slight coronary attacks, 457
CORPUS LUTEUM
—maintenance of pregnancy in intact rabbits in the absence of corpora lutea, 512
CORTISONE
—clinical observations on the use of cortisone in ophthalmic diseases, preliminary report, 313
—cortisone in experimental syphilis, 97
—cortisone in Sydenham's chorea, 604
—effect of cortisone upon the experimental cardiovascular and renal lesions produced by anaphylactic hypersensitivity, 406
—marked lipemia resulting from the administration of cortisone, 584
—nebulized cortisone in bacterial pneumonia, 217
—pituitary adrenocorticotropic hormone (ACTH) and cortisone in diseases of the skin, 736
—treatment of leukemia with cortisone, 582
COXSACKIE VIRUS
—isolation of an agent similar to the Coxsackie virus, application of a complement fixation test to clinical diagnosis, 41
CRANIAL NERVES
sixth nerve:
—sixth-nerve palsy after lumbar puncture and spinal analgesia, 510
CURARE—*See also Drugs, curare-like.*
—curare as an adjunct to relaxation in esophagoscopy, 740
—"curarisation" of denervated muscle, 714
—evolution of the use of curare in anesthesiology, 720
—pharmacology of calabash curare, 712
—recent advances in the pharmacology of curare, 711
DDT
—purpura following exposure to DDT, 319
DEAFNESS
—prevention of deafness, 230
DECAMETHONIUM
—clinical experiences with decamethonium bromide ("Syncurine"), 717
—pharmacology of decamethonium, 714
DEMENTIA
senile:
—psychological investigation of senile dementia, 747
DERMATITIS
atopic:
—atopic dermatitis, a clinical psychiatric study, 503
exfoliative:
—quinidine induced exfoliative dermatitis, 733
DERMATOLOGY
—antibiotics in dermatology, 734
—application of psychology to dermatology, 503
DERMATOMYOSITIS
—dermatomyositis with vesicular and bullous lesions, 733
DERMATOSES
occupational:
—actual causes of certain occupational dermatoses, 735
pyogenic:
—treatment of the pyogenic dermatoses, 734
DESOXYCORTICOSTERONE
—anticonvulsive properties of desoxycorticosterone, 601
—potentiation of pressor effects of nor-epinephrine and epinephrine in man by desoxycorticosterone acetate, 291
DEUTERIUM
—use of the mass spectrometer to measure deuterium in body fluids, 34
DEXEDRINE SULFATE
—effects of dexedrine sulfate on nausea and vomiting of pregnancy, 378
DIABETES MELLITUS
—blood lipid fractions and diabetic neuritis, 460
—juvenile diabetes and pregnancy, 744
—nutritional aspects of certain cardiovascular disorders including those occurring in diabetics, 589
—relation between neuritis and the clinical background in diabetes mellitus, 454
treatment:
—urinary acetone, its detection and value in treating ambulatory diabetics, 453
DIAGNOSIS
errors in:
—on the psychology of some diagnostic errors, 387
DICUMAROL
—rutin and dicumarol in ophthalmology, 232
DIETHYLSTILBESTROL
—urinary excretion of pregnanediol in pregnant women receiving diethylstilbestrol, 108

DIGITALIS
—modern digitalis preparations with special reference to digitoxin, 285, 579
DIGITOXIN
—modern digitalis preparations with special reference to digitoxin, 285, 579
DIGOXIN
—effect of digoxin on ventricular pressure in hypertensive and ischaemic heart failure, 31
DIHYDROERGOTAMINE
—treatment of attacks of migraine with dihydroergotamine, 391
DIHYDROSTREPTOMYCIN
oral administration:
—relative absorption of salts of streptomycin and dihydrostreptomycin after oral administration, 450
DIURETICS
mercurial:
—comparative study of human cutaneous reactivity to thiomerin and other mercurial diuretics, 289
—comparison of the newer mercurial diuretics, 583
—mercurial diuretics in the treatment of congestive heart failure, 451
DRAMAMINE
—control of vestibular toxic effects of streptomycin by dramamine, 460
DRUGS
anti-curare:
—pharmacology of anti-curare agents, 718
curare-like:
—evaluation of curarizing drugs in man, critique of experiments on unanesthesized subjects, 720
—new series of synthetic curare-like drugs, 716
—some aspects of the relationship between chemical constitution and curare-like activity, 718
—synthetic curare-like agents and their antagonists, 719
synthetic:
—synthetic drugs influencing neuromuscular activity, 715
DUODENUM
ulcer—See also Gastroduodenal Ulcer.
—vagotomy and duodenal ulcer, 397
DYSFUNTIO VEGETATIVA DIGESTIVA
—glucose-tolerance test in the diagnosis of dysfunctio vegetativa digestiva, 32
DYSMENORRHEA
—antihistaminics in dysmenorrhea, 746
—treatment of intractable dysmenorrhea by presacral sympathectomy, 519
EAR
embryonic:
—embryonic hearing organs after maternal rubella, 518
external:
—thirty-three operations for aplasia of the ear and imperforation of the auditory canal, 738
internal:
—acoustic trauma, 737
middle—See Otitis Media.
surgery—See Fenestration Operation.
EAR DRUM
—artificial ear drum, 737
ECZEMA
—incidence and management of eczema in the first year of life, 351
EDITORIAL
nature of general practice, 87
ELECTROCARDIOGRAPHY—*See also Vectorcardiograph.*
—electrocardiographic patterns in slight coronary attacks, 457
—genesis of the electrocardiogram in right ventricular hypertrophy, 341
—variations in the electrocardiogram changes in emotional state, 748
ELECTROENCEPHALOGRAPHY
—arterial tension and EKG in the period of climacterium in women, 382
—electroencephalographic findings in measles encephalitis, 265
ELECTROSHOCK
—memory studies in electric convulsion therapy, 172
EMOTIONS—*See Psychosomatic Medicine.*
EMPHYSEMA
—physiological aspects and treatment of emphysema, 407
ENCEPHALITIS
measles:
—electroencephalographic findings in measles encephalitis, 265
ENDOCARDITIS
bacterial:
—in vitro sensitivity to eight antibiotics of streptococci and staphylococci recovered from cases of bacterial endocarditis, 449
—studies relative to the chemotherapy of bacterial endocarditis, 332
—terramycin in the treatment of subacute bacterial endocarditis, case report, 728
EPILEPSY
—cerebral schistosomiasis producing epilepsy in a veteran of the Pacific, 509
—medical treatment of epilepsy today, 345
—role of hypnosis in differentiation of epileptic from convulsive-like seizures, 104
—use of phenurone in convulsive disorders in children, 38
EPINEPHRINE
—comparative effects of small intravenous doses of epinephrine upon arterial pressure and pulse rate in normotensive subjects and in hypertensive patients before and after thoracolumbar sympathectomy, 287
—potentiation of pressor effects of nor-epinephrine and epinephrine in man by desoxycorticosterone acetate, 291
—role of epinephrine in the secretion of the adrenal cortex, 94
ERGOTAMINE—*See Dihydroergotamine.*
ERYTHEMA MULTIFORME
—ocular-mucous membrane syndrome, 494
ERYTHROCYTES
—erythrocyte survival studies in children,

methods and general observations, 317
—erythrocyte survival studies in childhood, studies in Mediterranean anemia, 317
—erythrocyte survival studies in childhood, unusual familial hemolytic anemias associated with intrinsic erythrocyte abnormality, 318
ESOPHAGOSCOPY
—curare as an adjunct to relaxation in esophagoscopy, 740
ESOPHAGUS
cancer:
—case of generalized scleroderma simulating oesophageal carcinoma, 348
ETHER
—ether, an estimation of its use in the treatment of the psychoneuroses, 507
EURAX
—clinical evaluation of N-ethyl-o-crotanotoluide (Eurax) as an antipruritic, 598
EXERCISE
—effect of a short period of strenuous exercise on hemoconcentration, 724
EXTRAOCULAR MUSCLES
—paralysis of extraocular muscles following spinal anesthesia, 269
EYE STRAIN
—analysis of television and eye strain, 489
EYELIDS
—granuloma arteficiale in the region of the eye, 314
—gummas of the eyelid, 309
EYES
—eye in hyperthyroidism, 488
—ocular manifestations of hysteria, 492
—relative growth of the eye, 233
diseases:
—clinical observations on the use of cortisone in ophthalmic diseases, preliminary report, 313
—modern lighting and ocular pathology, 742
—topical aureomycin (oily suspension) in ophthalmology, first reports on 47 cases, 490
foreign bodies:
—removal of intra-ocular foreign bodies by the anterior and posterior routes, 48
fundus:
—effect of certain vasomotor drugs on the vessels of the fundus oculi, 233
infections:
—bacteriology of eye infections in the Mid-West, U. S. A., 491
intraocular pressure:
—effect of the suction cup sucked on the surface of the eye on intraocular pressure and the serviceableness of the suction cup as an opthalmodynamometer, 307
syphilis—See Optic Neuritis.
tuberculosis:
—four cases of ocular tuberculosis treated with trimethoxy-aurine, 495
—further experiences with PAS, 490
—studies on experimental ocular tuberculosis, effect of streptomycin and promizole in experimental ocular tuberculosis in the normal rabbit, 316
tumors:
—modern methods of treatment of malignant tumours of the eye, 49
FALLOPIAN TUBES
—carcinoma of the fallopian tube, a case report, 105
—false diagnosis of potency of the fallopian tubes, 518
—recent trends in the study of infertility, ovaries and tubes, with some clinical considerations of the male, 676
FAMILY
—family structure and psychic development, 602
FAT
—occurrence and distribution of fat in human muscles at various age levels, 725
FATIGUE
—oxygen consumption during and after exercise and its relation to the degree of fatigue as measured by the method of electric flicker, 346
—professional differences of fatigue as revealed by the method of electric flicker, 346
FENESTRATION OPERATION
—fenestration by cold fracture method, preliminary report of an improved technic, 54
FERTILITY—*See also Conception; Sterility.*
—biologic and cultural factors affecting human fertility, 659
FEVER
—discussion on short-term fevers of obscure origin, 326
FILTERS
ophthalmic:
—effect of light absorbing filters on the discernibility of a television test pattern, 741
FLAXEDIL
—clinical evaluation of *d*-tubocurarine and tri (diethylaminoethoxy) 1, 2, 3 benzene (Flaxedil) and a series of tri-methyl phenyl ammonium compounds in anesthetized man, 723
—pharmacology of flaxedil, 716
GALLBLADDER
—congenital absence of the gall bladder, a possible hereditary defect, 282
GAMMA GLOBULIN
—technical factors affecting the estimation of serum gamma globulin by the zinc turbimetric method of Kunkel, 591
GANTRISIN
—gantrisin in the treatment of conjunctivitis, a clinical evaluation, 488
GARTNER'S DUCT
—Gartner's duct cyst complicating pregnancy, 517
GASTRECTOMY
—evaluation of subtotal gastrectomy for gastric and duodenal lesions, 437
GASTRODUODENAL ULCER
—an appraisal of the psychological relationship of coronary disease to peptic ulcer, 386
—peptic ulcer in man, a new antacid made to meet requirements of antacid therapy, chemical and laboratory work, 405

GASTROINTESTINAL TRACT—*See also Intestines.*
—arthritis as related to gastroenterology, 404
perfusion:
—intestinal and gastric perfusion in a patient with severe chronic uremia, 229
GAUCHER'S DISEASE
—acute form of Gaucher's disease in three children in one family, 264
GEL-ALONE
—clinical experience with a new gel-alone method of contraception, 675
GENERAL PRACTICE—*See also Physicians*
—nature of general practice (editorial), 87
GENERAL TRACT
female:
—biochemical studies of the female genital tract, 669
male:
—biochemistry of the male genital tract, 671
GLAUCOMA
—atropine as a pressure-reducing agent in juvenile glaucoma, 314
—glaucoma, surgical complications, 278
—postoperative gonioscopic evaluation of pressure reducing operations in simple glaucoma, 277
GLOMERULONEPHRITIS—*See Nephritis.*
GLUCOSE
—carbohydrate utilization in surgical patients, the blood lactic acid in pre- and postoperative patients after the administration of glucose, 43
GLUCOSE TOLERANCE
—glucose tolerance test in the diagnosis of dysfuntio vegetativa digestiva, 32
GLUTAMIC ACID
—does glutamic acid administration influence mental function? 221
GONIOSCOPY
—postoperative gonioscopic evaluation of pressure reducing operations in simple glaucoma, 277
GONORRHEA
—studies on the synergistic action of antibiotics and sulfonamides in the treatment of gonorrhea in males, 726
GROUP THERAPY
—therapeutic effect of group morale in a psychiatric hospital ward, 506
GRANULOMA ARTEFICIALE
—granuloma arteficiale in the region of the eye, 314
GRANULOMA INGUINALE
—granuloma inguinale and its treatment with oral aureomycin, 42, 218
GROWTH
—annual increment norms for ten measures of physical growth on children four to eight years of age, 219, 323
—body size norms for children, four to eight years of age, 317
GYNECOLOGY
infections:
—aerosol therapy in gynecologic infections, 745
HEAD
injuries:
—post-traumatic chiasm syndrome with intracranial pneumatocele, 508
HEADACHE—*See also Migraine.*
—headache related to low back pain, 389
—myogenic headache, 388
HEART
—cardiac arrest, 431
block:
—oxygen therapy in bundle branch block, 285
HEART DISEASE
—effect of digoxin on the right ventricular pressure in hypertensive and ischaemic heart failure, 31
—genesis of the electrocardiogram in right ventricular hypertrophy, 341
—hemiplegia in the course of mitral cardiac disease, 510
—management of the pregnant cardiac patient, 108
—mechanism and management of myocardial insufficiency, 455
congenital:
—brain abscess and congenital heart disease, 344
—cardiac catheterization in the diagnosis of congenital heart disease, 407
—congenital heart disease, clinical considerations, 407
—physiological studies in congenital heart disease, a comparison of the right and left auricular, capillary and pulmonary artery pressure in nine patients with auricular septal defect, 284, 581
—physiological studies in congenital heart disease, the physiological findings in thirty-four patients with isolated pulmonary valvular stenosis, 284, 581
diagnosis:
—cardiological case finding by means of mass miniature radiography, 342
rheumatic:
—effect of ACTH on acute rheumatic carditis, 586
surgical treatment:
—recent advances in surgical treatment of heart lesions, 439
treatment:
—mercurial diuretics in the treatment of congestive heart failure, 451
—rubellin, a new digitalis-like drug for heart disease, some experimental and clinical experiences with its use, 406
HEMAGGLUTININS
—studies of hemagglutinins in hereditary spherocytosis and in acquired hemolytic anemia, their relationship to the hypersplenic mechanism, 596
HEMATURIA
—hematuria, 454
HEMIPLEGIA
—hemiplegia in the course of mitral cardiac disease, 510
HEMOPHILIA
—practical aspects of hemophilia, 45
HEMOPTYSIS
—hemoptysis in juvenile tuberculosis, 260

HEPATITIS
—hepatitis with jaundice in children, morphologic investigations, 261
infectious:
—studies on the sequelae of acute infectious hepatitis, 332
HEREDITY
—use of monozygous and dizygous twins in the study of human heredity, 264
HERPES ZOSTER
—postherpetic trigeminal neuralgia, 508
HISTAMINE
—effect of generalized convulsions on the blood histamine in man, 345
—liberation of histamine during muscular contraction in man, 323
HISTOPLASMOSIS
—histoplasmosis of infants with report of seven cases, 322
HOME CARE
—home care for the convalescent and the elderly, 594
HORMONES
—endocrine gerontotherapy, the use of steroid hormone combinations in male patients, 595
HYALURONIDASE
—use of hyaluronidase in some corneal affections, 232
HYDATID DISEASE
—hepatic hydatid disease, 95
—treatment of pulmonary hydatid disease, 330
HYPERCHOLESTEROLEMIA
—hypotension or hypertension with hypercholesterolemia and their therapy, 590
—insidious thrombosis of the abdominal aorta with hypercholesterolemia, 290
HYPERPARATHYROIDISM
—chronic renal disease with secondary hyperparathyroidism, 730
—primary hyperparathyroidism, 433
HYPERTENSION
—comparative effects of small intravenous doses of epinephrine upon arterial pressure and pulse rate in normotensive subjects and in hypertensive patients before and after thoracolumbar sympathectomy, 287
—comparative effects of small intravenous doses of L-nor-epinephrine upon arterial pressure and pulse rate in normotensive subjects and in hypertensive patients before and after thoracolumbar sympathectomy, 288
—hypotension and hypertension with hypercholesterolemia and their therapy, 590
surgical treatment:
—surgical treatment of arterial hypertension in 108 cases, 395
—surgical treatment of so-called "essential" hypertension, 432
HYPERTHYROIDISM
—eye in hyperthyroidism, 488
—myasthenia gravis associated with hyperthyroidism, report of a case with thymectomy, 511
—prophylthiouracil in thyrotoxicosis, alternate cases treated medically and surgically, 90
—radioactive iodine in the treatment of hyperthyroidism, 451, 592
HYPNOSIS
—role of hypnosis in differentiation of epileptic from convulsive-like seizures, 104
HYPOGLYCEMIA
—significance of arterial blood sugar in hypoglycemia, 452
HYPOTENSION
—hypotension or hypertension with hypercholesterolemia and their therapy, 590
HYPOTHALAMUS
—hypothalamus and psychosomatic medicine, 498, 603
HYSTERECTOMY
vaginal:
—effect of penicillin vaginal suppositories on morbidity in vaginal hysterectomy and on the vaginal flora, 115
—vaginal hysterectomy in the aged, 521
HYSTERIA
—ocular manifestations of hysteria, 492
INDUSTRIAL MEDICINE
—acoustic trauma, 757
—actual causes of certain occupational dermatoses, 755
INFANT MORTALITY
—fetal salvage in the late toxemias of pregnancy, 114
INFANTS
—appraisal of the cardiovascular status in infancy by physical examination, 454
—first results with aureomycin in infections in infants, 39
—growth and development of Negro infants, 221, 323
—histoplasmosis of infants with a report of seven cases, 322
—incidence and management of eczema in the first year of life, 351
—intestinal obstruction in the infant and newborn, 319
—obstruction of the lower portion of the urinary tract in infants and young children, 170
—otitis media in infancy, treatment with streptomycin, report of five cases caused by Pseudomonas aeruginosa (Bacillus pyocyaneus), 319
—vitamin E blood levels in premature and full term infants, 603
INFERTILITY—*See sterility.*
INFLUENZA
—influenza viral infections in Boston, September 1947 to August 1949, a study of the serologic response of patients and of the antigenic differences among the influenza viruses that were isolated, 324
INSULIN
—influence of insulin on the glucose and potassium management of the isolated rat diaphragm, a method for the demonstration of insulin in blood serum, 585

INTESTINES
—intestinal transit time in achlorhydria, 462
atresia:
—operative recovery of multiple atresia of the ileo-cecal area, 444
bacterial flora:
—effects of terramycin on the bacterial flora of the bowel in man, 228
obstruction:
—incomplete obstruction of the small intestine, 445
—intestinal obstruction in the infant and newborn, 399
IRIDO-CYCLITIS
—is irido-cyclitis a tissue or a humoral disease? 495
IRON
—anemia of infection, response to massive doses of intravenously administered saccharated oxide of iron, 89
JAUNDICE
—hepatitis with jaundice in children, morphologic investigations, 261
JOINTS
diseases—See also Arthritis.
—degenerative joint disease, osteoarthritis process therapy theory, 591
KERATITIS
—keratitis of mycosis fungoides, 496
KERATOSES
—seborrheic and senile keratoses, 736
—treatment of senile keratoses with podophyllin, 350
KIDNEYS
diseases:
—chronic renal disease with secondary hyperparathyroidism, 730
tumors:
—kidney tumors, types, diagnosis, treatment, 443
LABOR
presentations:
—transverse presentations of the fetus, 515
LABYRINTH
—labyrinthine vertigo, 738
LARYNX
cancer:
—epidermoid carcinoma of the larynx occurring in two children with papilloma of the larynx, 51
LEPROSY
—lepra, psoriasis, or the Willan-Plumbe syndrome, 42
LEUKEMIA
—treatment of leukemia with cortisone, 582
LEUKOCYTES
—leukocytic pattern during streptomycin treatment of pulmonary tuberculosis, 328
LIGHTING
—modern lighting and ocular pathology, 742
LIP
cancer:
—treatment of cancer of the lip, 751
LIPEMIA
—marked lipemia resulting from the administration of cortisone, 584
LIPIDS
—blood lipid fractions and diabetic neuritis, 460
LIPIODOL
—uterotubal studies using lipiodol, 106
LIPOID METABOLISM
—pathogenesis of atheroma, with special reference to disordered lipoid metabolism, 292
LIVER
—hepatic hydatid disease, 95
cirrhosis:
—observations on portal cirrhosis with ascites, 731
—study of dietary factors, alcoholic consumption and laboratory findings in 100 patients with hepatic cirrhosis and 200 non-cirrhotic controls, 54
function:
—bromsulfalein liver function test with special reference to renal excretion, 730
—liver dysfunction following abdominal operations, significance of postoperative hyperbilirubinemia, 217
L-NOR-EPINEPHRINE
—comparative effects of small intravenous doses of L-nor-epinephrine upon arterial pressure and pulse rate in normotensive subjects and in hypertensive patients before and after thoracolumbar sympathectomy, 288
LUMBAR PUNCTURE
—sixth-nerve palsy after lumbar puncture and spinal analgesia, 510
LUNGS
arterioles:
—observations on autonomic participation in pulmonary arteriolar resistance in man, 343
cancer:
—carcinoma of the lung, 749
—smoking and carcinoma of the lung, 327
diseases:
—pulmonary sclerosis, 342
—subclinical mineral oil pneumonitis, 456
—treatment of pulmonary hydatid disease, 330
edema:
—clinical aspects of cardiac asthma and acute pulmonary edema with special reference to blood pressure, 458
hemorrhage:
—pulmonary hemorrhage, its control by the use of intravenous pituitrin, 458
LYMPHOCYTES
—simple method to separate lymphocytes from the blood, 727
MACULA
—hole in the macula, 233
MEASLES
—pre-eruptive neurological complications of the common contagious diseases, rubella, rubeola, roseola, and varicella, 265
encephalitis—see Encephalitis, measles.
MENINGITIS
streptococcal:
—streptococcic viridans meningitis, review of

the literature and report of nine recoveries, 448
tuberculous:
—cure of tuberculous meningitis with streptomycin therapy appears to be a permanent cure, 724
—diagnosis and treatment of tuberculous meningitis in children, 222
—effects of intrathecal tuberculin and streptomycin in tuberculous meningitis, 225
—natural history and pathogenesis of miliary and meningeal tuberculosis in children, 322
MENOPAUSE
—arterial tension and EKG in the period of climacterium in women, 382
MENTAL HOSPITALS
—problem of the long hospitalized patient, 505, 601
—tuberculosis in mental hospitals, 505, 601
MERCUHYDRIN
—subcutaneous administration of mercuhydrin (meralluride sodium solution), 36
MERCURIALS—*See Diuretics, mercurial.*
MERALLURIDE SODIUM—*See Mercuhydrin.*
MESONEPHROS
—mesonephric remnants in the human female, 520
MICROSPORUM
—variation in Microsporum canis and Microsporum audonini, 350
MIGRAINE
—migraine, 510
—migraine headache, an anlysis of 124 cases treated by head traction manipulation, 390
—treatment of attacks of migraine with dehydroergotamine, 391
MITRAL VALVE
stenosis:
—surgical treatment of mitral stenosis, 402
MOTION SICKNESS
—motion sickness in the military service, 461
MULTIPLE SCLEROSIS
—emotional stress in relation to attacks of multiple sclerosis, 391
MUSCLES
—muscular dysfunction under emotional stress, diagnosis and treatment, 599
contraction:
—liberation of histamine during muscular contraction in man, 323
MYASTHENIA GRAVIS
—myasthenia gravis associated with hyperthyroidism, report of a case with thymectony, 511
MYCOSIS FUNGOIDES
—keratitis of mycosis fungoides, 496
MYDRIASIS
—functional unilateral mydriasis, report of three cases, 273
MYOCARDIUM
infarction:
—"painless" myocardial infarction, 283
—role of the small coronary branches in the pathogenesis of myocardial infarction, 283
MYTOLON CHLORIDE—*See WIN 2747.*
NAILS
—"base coat" nail disease, 97
NARCOSYNTHESIS
—narcosynthesis, an invaluable psychiatric technique, 502
NASAL SINUSES
—on conservative treatment of different forms of accessory sinus disease, 739
NEGROES
—growth and development of Negro infants, 221, 323
NEOMYCIN
—clinical appraisal of neomycin, 218
—clinical use of neomycin, a preliminary report, 335
—new antibiotics in the treatment of tuberculosis, 727
NEPHRITIS
—unusual glomerulonephritis in young children, probably radiation nephritis, 39
NERVOUS SYSTEM
diseases:
—pre-eruptive neurological complications of common contagious diseases — rubella, rubeola, roseola, and varicella, 265
N-ETHYL-O-CROTANO-TOLUIDE — *See Eurax.*
NEURALGIA
—segmental neuralgia, 390
trigeminal:
—postherpetic trigeminal neuralgia, 508
NEURINOMAS
—neurinoma of the orbit, 310
NEURITIS
—blood lipid fractions and diabetic neuritis, 460
—relation between neuritis and the clinical background in diabetes mellitus, 454
NEUROMUSCULAR ACTIVITY
—synthetic drugs influencing neuromuscular activity, 715
NEWBORN
—Staphylococcus pyogenes in new-born babies in a maternity hospital, 266
nurseries:
—choice of rooming in or newborn nursery, 383
NOISE DEAFNESS
—acoustic trauma, 737
NOR-EPINEPHRINE
—potentiation of pressor effects of norepinephrine in man by desoxycorticosterone acetate, 291
NUTRITION—*See also Diet.*
—nutritional therapy in the management of respiratory anaphylaxis or allergy, 33
OBESITY
—effective treatment of obesity, Benzedrine (amphetamine), 347
—emotional aspects of obesity, 499
OBSTETRICS
anesthesia:
—analgesia, anesthesia and amnesia in obstetrics, 379
—choice of analgesics during the first stage of labor, 743
OCULAR-MUCOUS MEMBRANE SYNDROME—*See Erythema Multiforme.*

OLD AGE
—better bread as a source of protein and calcium for the aged, 460
—endocrine gerontotherapy, the use of steroid hormone combinations in male patients, 595
—home care for the convalescent and the elderly, 594
—nutritional status of the aged, public health aspects, 578
—rejuvenative, or preventive and eliminative treatment of senility, 346
—senile changes in the histologic structure of the thyroid gland, 33
surgery:
—mortality in geriatric surgery, 392
OPHTHALMOLOGY
—placental implants in ophthalmology, 274
OPTIC NEURITIS
—syphilitic optic neuritis, 276
OPTOMETRY
—relation of refractive error to optometric tests, 267
—relationship of pre-optometry college work to performance in optometry college, 314
ORBIT
surgery:
—present status of orbital implants, 311
—use of paladon as a heteroplastic implantation material in bony defects of the orbit and its vicinity, 309
tumors:
—neurinoma of the orbit, 310
ORBITONOMETRY
—clinical orbitonometry, 312
ORETON
—oreton and ACTH found to improve vision and general physical condition among relatively young cataract patients suffering from glandular deficiencies, 497
ORTHOPTICS
—balancing visual stimuli in orthoptics, 267
—orthoptic training in convergence deficiency uncovers latent vertical imbalance, 269
OSTEOARTHRITIS
—degenerative joint disease, osteoarthritis process therapy theory, 591
—personality factors in osteoarthritis, 387
OSTEOMYELITIS
typhoid:
—treatment of typhoid osteomyelitis with chloramphenicol, 336
OTITIS MEDIA
—artificial ear drum, 737
—Maginot line of otology, dependence on antibiotics in suppurative middle ear disease, facts and fancies, 52
—otitis media acuta in children 0-3 years of age, 227
—otitis media in infancy, treatment with streptomycin, report of five cases caused by Pseudomonas aeruginosa (Bacillus pyocyaneus), 319
OTOSCLEROSIS
—emotional factors in otosclerosis, 739
OVARIES
—recent trends in the studies of infertility, ovaries and tubes, with some clinical considerations of the male, 676
OXYGEN
—femoral venous blood oxygen studies upon normal and abnormal subjects at rest and after exercise, 730
OXYGEN THERAPY
—oxygen therapy of bundle branch block, 285
PALADON
—use of paladon as a heteroplastic implantation material in bony defects of the orbit and its vicinity, 309
PANCREATITIS
—acute pancreatitis, 441
PARA-AMINOSALICYLIC ACID—*See PAS*.
PARATYPHOID FEVER
treatment:
—problem of recurrences in typhoid and paratyphoid fever treated with chloramphenicol, 337
PARENTHOOD
planned:
—present-day international trends in family planning, 664
PAS
—benemid and carinamide, comparison of effects on para-aminosalicylic acid (PAS) plasma concentration, 329
—further experience with PAS, 490
—studies on the behavior of para-aminosalicylic acid on tuberculous pleural effusions, 329
PELVIS
diseases:
—method of diagnosing and treating functional pelvic disease, 384
PENICILLIN
—aerosol-penicillin therapy for infants and children, 38
—dangerous masking effect of penicillin in perforative appendicitis with secondary peritonitis, 441
—effect of penicillin vaginal suppositories on morbidity in vaginal hysterectomy and on the vaginal flora, 115
—occurrence of false positive tests for albumin and glucose in the urine during the course of massive penicillin therapy, 335
—two-hour versus three-hour administration of crystalline penicillin G, the treatment of early syphilis, 98
—typhoid fever successfully treated with penicillin, 597
—value of penicillin alone in the prevention and treatment of congenital syphilis, 513
blood levels:
—effect of benemid on plasma penicillin levels, 582
local application:
—morphyologic and cytochemical vaginal-smear study, effect of topical penicillin in the treatment of focal infections of the vaginal tract, 382
new preparation:
—compenamine, report of a very low reac-

tion rate in therapy with a new penicillin salt, 577
resistance to:
—a pressing problem, penicillin-resistant staphylococci, 450
sensitivity to:
—purpura as a manifestation of penicillin sensitivity, 733
PEPTIC ULCER—*See Gastroduodenal Ulcer.*
PERITONEOSCOPY
—peritoneoscopy, 438
PERSONALITY
—family structure and psychic development, 602
PERTUSSIS
—human hyperimmune serum and streptomycin in the treatment of pertussis in infants and young children, 40
PHENURONE
—use of phenurone in convulsive disorders in children, 38
PHYSICIANS
—conduct of the internist toward the patient and his family when a diagnosis of malignancy is established, 587
—preventive procedures in general practice, 728
—responsibility of the general practitioner in the public health aspects of tuberculosis, 577
PITUITARY
—inactivation of the antidiuretic hormone of the posterior pituitary gland by blood from pregnant patients, 376
PITUITRIN
—pulmonary hemorrhage, its control by the use of intravenous pituitrin, 458
PLACENTA
implants:
—placental implants in ophthalmology, 274
PLACENTA PREVIA
—diagnosis and treatment of placenta previa, 106, 379
PLEURA
effusions:
—studies on the behavior of para-aminosalicylic acid in tuberculous pleural effusions, 329
PNEUMONIA
—effects of adrenocorticotropic hormone in pneumonia, clinical, bacteriological and serological studies, 93, 403
—nebulized cortisone in bacterial pneumonia, 217
—primary pneumococcic pneumonia at the Cincinnati General Hospital, 1936-1950, 456
—treatment of pneumonia with bacitracin, 727
atypical:
—atypical pneumonia, 325
—non-bacterial pneumonias, 331
—primary atypical pneumonia, 325
PODOPHYLLIN
—treatment of senile keratoses with podophyllin, 350
POPULATION
—effect of public health developments upon population growth, 661
—population as a world problem, 637
POSTOPERATIVE CARE
—carbohydrate utilization in surgical patients, the blood lactic acid in pre- and postoperative patients after the administration of glucose, 43
—prevention of thromboses during the "postoperative disease," 447
—studies in vitamin C and protein metabolism on surgical patients on a routine hospital diet, 394
PREGNANCY
—cervical changes in pregnancy, labor and the puerperium, 113
—inactivation of the antidiuretic hormone of the posterior, pituitary gland by blood from pregnant patients, 376
—maintenance of pregnancy in intact rabbits in the absence of corpora lutea, 512
—life expectancy of pregnant women, 107
—urinary excretion of pregnanediol in pregnant women receiving diethylstilbestrol, 108
complications—*See also Toxemias of Pregnancy.*
—acute surgical emergencies in the abdomen in pregnancy, 436
—effects of dexadrine sulfate on nausea and vomiting of pregnancy, 378
—Gartner's duct cyst complicating pregnancy, 517
—obstetrical approach to abdominal war wounds in late pregnancy, 401
ectopic:
—ectopic pregnancy, 516
—full term abdominal pregnancy with delivery of a living child, 744
in older women:
—elderly primigravida, a thirteen year review, 377
intercurrent diseases:
—juvenile diabetes and pregnancy, 744
—management of the pregnant cardiac patient, 108
tests:
—comparative study of chemical tests for the early diagnosis of pregnancy, including a new colorimetric determination, 375
PREGNANDIOL
—results and comments on a few examinations of urinary pregnandiol in obstetrics and gynecology, 512
PREVENTIVE MEDICINE
—preventive procedures in general practice, 728
PROMIZOLE
—studies in experimental ocular tuberculosis, effect of streptomycin and promizole in experimental ocular tuberculosis in the normal rabbit, 316
PROPYLTHIOURACIL
—prophylthiouracil in thyrotoxicosis, alternate cases treated medically and surgically, 90
PROSTATE
diseases:
—back pain role of prostatic and urethral

disease, 48
PROTEIN HYDROLYSATE
—effect of protein hydrolysate solutions on gastric acidity of peptic ulcer, 95
PROTEINS
—studies in vitamin C and protein metabolism in surgical patients on a routine hospital diet, 394
PROTHROMBIN
—some factors concerned with the two stage plasma prothrombin assay, 584
PRURITUS
—clinical evaluation of N-ethyl-o-crotonotoluide (Eurax) as an antipruritic, 598
PSEUDOMONAS AERUGINOSA
—otitis media in infancy, treatment with streptomycin, report of five cases caused by Pseudomonas aeruginosa (Bacillus pyocyaneus), 319
PSORIASIS
—lepra, psoriasis, or the Willian-Plumbe syndrome, 42
—undecylenic acid administered orally in the treatment of psoriasis, 42
PSYCHIATRIC HOSPITALS—*See Mental Hospitals.*
PSYCHIATRY
—evaluation of modern psychiatric treatment (practical considerations in the treatment of the mentally ill), 101
—examination of the accused in Massachusetts (1921-1949), 99
PSYCHONEUROSES
—ether, an estimation of its use in the treatment of the psychoneuroses, 507
—manifestations of psychoneuroses occurring in later life, 385
PSYCHOPATHIC PERSONALITY
—investigation of autonomic response in psychopathic personalities, 173
PSYCHOSES
—cytologic changes in cells of thalamic nuclei in senile, paranoid and manic psychoses, 100
—disturbances of vision in mental disease, 316
PSYCHOSOMATIC MEDICINE
—application of psychology to dermatology, 503
—appraisal of the psychologic relationship of coronary disease to peptic ulcer, 386
—atopic dermatitis, a clinical psychiatric study, 503
—emotional aspects of obesity, 499
—emotional factors in otosclerosis, 739
—emotional stress in relation to attacks of multiple sclerosis, 391
—hypothalamus and psychosomatic medicine, 498, 603
—mood, anger and somatic dysfunction, 498
—muscular dysfunction under emotional stress, diagnosis and treatment, 599
—personality factors in osteoarthritis, 387
—psychosomatic illness, 388
—psychosomatic medicine in U.S.S.R., sleep cure, 502
—psychosomatic study of ulcerative colitis, 501
—variations in the electrocardiogram changes in emotional state, 748
PTERYGIUM
—surgical treatment of recurrent pterygium by an autoplastic procedure with free graft from the conjunctiva, 496
PUBLIC HEALTH
—effect of public health developments upon population growth, 661
PULMONARY VALVE
stenosis:
—physiological studies in congenital heart disease, the physiological findings in thirty-four patients with isolated pulmonary valve stenosis, 284, 581
PURPURA
—purpura as a manifestation of penicillin sensitivity, 733
—purpura following exposure to DDT, 319
QUINIDINE
—quinidine induced exfoliative dermatitis, 733
—studies on the effects of parenteral quinidine administration, 288
RADIOACTIVE ISOTOPES
—radioactive iodine in the treatment of hyperthyroidism, 451, 592
—studies of radiogallium as a diagnostic agent in bone tumors, 595
—therapeutic use of radioactive isotopes in the Royal Cancer Hospital, 347
RADIOGALLIUM
—studies of radiogallium as a diagnostic agent in bone tumors, 595
REFRACTION
—relation of refractive error to optometric tests, 267
RESPIRATION
—reticulocyte reaction as an indicator of respiratory insufficiency, 326
RESPIRATORY TRACT
diseases:
—prophylaxis and treatment of acute respiratory diseases with antihistaminic drugs, I-IV, 50-51
RESUSCITATION
—cardiac arrest, 431
RETICULOCYTES
—reticulocyte reaction as an indicator of respiratory insufficiency, 326
RETICULOHISTIOCYTOMA
—reticulohistiocytoma ("ganglioneuroma") of the skin, 350
RETINA
—retinal mirror reflexes, 307
diseases:
—rutin and dicumarol in ophthalmology, 232
tumors:
—hemangioblastoma of the retina, 275
venous thrombosis:
—some remarks on retinal vein thrombosis and its treatment with anticoagulants, 312
RODENT ULCER
—rodent ulcer, surgical treatment, 750
ROENTGENOGRAPHY
—cardiological case finding by means of mass miniature radiography, 342

ROSEOLA
—pre-eruptive neurological complications of the common contagious diseases, rubella, rubeola, roseola, and varicella, 265
RUBELLA
—embryonic hearing organs after maternal rubella, 518
—pre-eruptive neurological complications of the common contagious diseases—rubella, rubeola, roseola, and varicella, 265
RUBELLIN
—rubellin, a new digitalis-like drug for heart disease, some experimental and clinical experiences with its use, 406
RUTIN
—rutin and dicumarol in ophthalmology, 232
SALT-FREE DIET
—comparative study of sodium-free salt substitutes, 594
SCARLET FEVER
—duration of the infection in scarlet fever, 321
SCHISTOSOMIASIS
—cerebral schistosomiasis producing epilepsy in a veteran of the Pacific, 509
SCLERODERMA
—case of generalized scleroderma, simulating oesophageal carcinoma, 348
SEMINAL VESICLES
—cysts of the seminal vesicle, 447
—seminal vesiculitis, 443
SERUM THERAPY
—human hyperimmune serum and streptomycin in the treatment of pertussis in infants and young children, 40
SILICOSIS
—silicosis problem, 579
SKIN
diseases:
—pituitary adrenocorticotropic hormone (ACTH) and cortisone in diseases of the skin, 736
tumors:
—reticulohistiocytoma ("ganglioneuroma") of the skin, 350
SLEEP
—psychosomatic medicine in U.S.S.R., sleep cure, 502
SMOKING
—smoking and carcinoma of the lung, 527
SPECTROMETER
—use of mass spectrometer to measure deuterium in body fluids, 34
SPERMICIDES
—critical study of methods of measuring spermicidal action, 673
SPHEROCYTOSIS
—studies of hemagglutinins in hereditary spherocytosis and in acquired hemolytic anemia, their relationship to the hypersplenic mechanism, 596
SPINAL CORD
diseases:
—effect of vitamin B_{12} in pernicious anemia and subacute degeneration of the cord, 732
tumors:
—tumors of the spinal cord without neurologic manifestations, producing low back pain and sciatic pain, 433
SPINE
—anatomical study of the human spinal column with emphasis on degenerative changes in the cervical region, 100
SPLENIC ARTERY
—aneurysm of the splenic artery, 442
SQUINT
—pre-orthoptic care of the very young squinters, 268
STAPHYLOCOCCI
—a pressing problem, penicillin-resistant staphylococci, 450
—Staphylococcus pyogenes in new-born babies in a maternity hospital, 266
STATUS ASTHMATICUS
—management of status asthmaticus, 37
STEREOENCEPHALOTOMY
—principles and applications of stereoencephalotomy, 99
STERILITY
—recent trends in the study of infertility, 676
—recent trends in the study of infertility, emotional aspects of infertility, 678
female:
—aetiology, diagnosis and surgical treatment of female sterility, 384
male:
—management of fertility in the male, 31
STEVENS-JOHNSON DISEASE
—Stevens-Johnson disease, 263
STILLBIRTHS
—risk of stillbirth in twin pregnancy related to sex and maternal age, an analysis of 90,386 twin maternities, 745
STOKES-ADAMS DISEASE
—Stokes-Adams disease, 284
STOMACH
mucosa:
—prolapsing redundant gastric mucosa, 578
surgery—See also Gastrectomy.
—amyotrophic lateral sclerosis observed in 5 persons after gastric resection, 96
ulcer—See also Gastroduodenal Ulcer
—certain aspects of benign and malignant gastric ulcer, 398
—effect of protein hydrolysate solutions on gastric acidity of peptic ulcer, 95
—large gastric ulcer, 398
STREPTOCOCCI
meningitis—See Meningitis, Streptococcal.
STREPTOKINASE-STREPTODORNASE
—cytological studies in association with local injections of streptokinase-streptodornase, 220, 266
STREPTOMYCIN
—cure of tuberculous meningitis with streptomycin therapy appears to be a permanent cure, 724
—effects of intrathecal tuberculin and streptomycin in tuberculous meningitis, 225
—human hyperimmune serum and streptomycin in the treatment of pertussis in infants and young children, 40

—leukocytic pattern during streptomycin treatment of pulmonary tuberculosis, 328
—otitis media in infancy, treatment with streptomycin, report of five cases caused by Pseudomonas aeruginosa (Bacillus pyocyaneus), 319
—studies in experimental ocular tuberculosis, effect of streptomycin and promizole in experimental ocular tuberculosis in the normal rabbit, 316
oral administration:
—relative absorption of salts of streptomycin and dihydrostreptomycin after oral administration, 450
toxicity:
—control of vestibular toxic effects of streptomycin by dramamine, 460
SUCTION CUP
—effect of the suction cup sucked to the surface of the eye on intraocular pressure and the serviceableness of the suction cup as an ophthalmodynamometer, 307
SUICIDE
—suicide, 173
SULFONAMIDES—*See also Gantrisin.*
—studies on the synergistic action of antibiotics and sulfonamides in the treatment of gonorrhea in males, 726
SURGERY
—present status of antibiotic and chemotherapeutic agents in surgery, 593
SYMPATHECTOMY
—reflex peripheral vasoconstriction, its use in the evaluation of patients for limb sympathectomy, 291
—treatment of intractable dysmenorrhea by presacral sympathectomy, 519
SYYNCURINE
—clinical experiences with decamethonium bromide ("Syncurine"), 717
SYPHILIS
—two-hour versus three-hour administration of crystalline penicillin G, the treatment of early syphilis, 98
congenital:
—value of penicillin alone in the prevention and treatment of congenital syphilis, 513
experimental:
—cortisone in experimental syphilis, 97
TELEVISION
—analysis of television and eye strain, 489
—effect of light-absorbing filters on the discernibility of a television test pattern, 741
TERRAMYCIN
—aureomycin and terramycin in acute intestinal amebiasis, 726
—effects of terramycin on the bacterial flora of the bowel in man, 228
—laboratory and clinical experience with terramycin hydrochloride, 338
—preliminary remarks on the treatment of acute intestinal amebiasis with terramycin, 725
—terramycin in the treatment of subacute bacterial endocarditis, case report, 728
rectal administration:
—failure of absorption of aureomycin and terramycin administered as a retention enema, 557
TESTOSTERONE—*See Oreton.*
THALAMIC NUCLEI
—cytologic changes in cells of thalamic nuclei in senile, paranoid and manic psychoses, 100
THIAMIN CHLORIDE
—reactions attributed to administration of thiamin chloride, 55, 96
THIOMERIN
—comparatvie study of human cutaneous reactivity to thiomerin and other mercurial diuretics, 289
THIOURACIL—*See Propylthiouracil.*
THORAX
surgery:
—resumé of anesthetic experience in intrathoracic operations, 392
—surgical lesions of the chest in children, 750
THROMBOSIS
—prevention of thrombosis during the "postoperative disease," 447
THYMECTOMY
—myasthenia gravis associated with hyperthyroidism, report of a case with thymectomy, 511
THYROID—*See also Hyperthyroidism.*
—influence of the thyroid on cerebral metabolism, 511
—senile changes in the histologic structure of the thyroid gland, 33
THYROTOXICOSIS—*See Hyperthyroidism.*
TOXEMIAS OF PREGNANCY
—fetal salvage in the late toxemias of pregnancy, 114
TRACHOMA
—use of aureomycin and chloramphenicol in the treatment of trachoma, 491
TREMETHOXY-AURINE
—four cases of ocular tuberculosis treated with tremethoxy-aurine, 495
TRI-METHYL PHENYL AMMONIUM COMPOUNDS
—clinical evaluation of *d* tubocurarine and tri (diethylaminoethoxy) 1, 2, 3 benzene (Flexedil) and a series of tri-methyl phenyl ammonium compounds in anesthetized man, 723
TUBERCULIN
—effects of intrathecal tuberculin and streptomycin in tuberculous meningitis, 225
TUBERCULIN TEST
—tuberculin test in young children as an aid in adult tuberculosis case finding, 261
TUBERCULOSIS
—bronchography in pulmonary tuberculosis, 434
—hemoptysis in juvenile tuberculosis, 260
—tuberclosis in mental hospitals, 505, 601
—tuberculin test in young children as an aid in adult tuberculosis case finding, 261
meningitis—See Meningitis, tuberculous.
miliary:
—natural history and pathogenesis of miliary and meningeal tuberculosis in children, 322
pleural—See Pleura
ocular—See Eyes, tuberculosis.

public health aspects:
—responsibility of the general practitioner in the public health aspects of tuberculosis, 577
treatment:
—chemotherapy of tuberculosis, 449
—leukocytic pattern during streptomycin treatment of pulmonary tuberculosis, 328
—new antibiotics in the treatment of tuberculosis, 727
TUBOCURARINE
—clinical evaluation of *d*-tubocurarine and tri (diethylaminoethoxy) 1, 2, 3-benzene (Flexedil) and a series of tri-methyl phenyl ammonium compounds in anesthetized man, 723
—clinical use of *d*-tubocurarine, 721
TIVINS
—risk of stillbirth in twin pregnancy related to sex and maternal age, an analysis of 90, 386 twin maternities, 745
—use of monozygous and dizygous twins in the study of human heredity, 264
TYPHOID FEVER
—problem of recurrences in typhoid and paratyphoid fever treated with chloramphenicol, 387
—typhoid fever successfully treated with penicillin, 597
complications—*See Osteomyelitis*
ULTRA SHORT-WAVE THERAPY
—ultra short-wave therapy in postoperative (extracapsular) treatment of cataract, 493
UNDECYLENIC ACID
—undecylenic acid administered orally in the treatment of psoriasis, 42
UREMIA
—intestinal and gastric perfusion in a patient with severe chronic uremia, 229
URETHRA
—diverticula of the female urethra, 170
—female urethra, a histologic study as an aid to urethral surgery, 171
diseases:
—back pain role of prostatic and urethral disease, 48
URINARY TRACT
diseases:
—hematuria, 454
infections:
—present status of antibiotics and other agents for the treatment of urinary infections, 321
obstruction:
—obstruction of the lower portion of the urinary tract in infants and young children, 170
URINE
analysis:
—occurrence of false positive tests for albumin and glucose in the urine during the course of massive penicillin therapy, 335
—urinary acetone, its detection and value in treating ambulatory diabetics, 453
UTEROSALPINGOGRAPHY
—uterotubal studies using lipiodol, 106
UTERUS
—recent trends in the study of infertility, cervix and uterus, 678
cervix:
—cervical changes in pregnancy, labor and the puerperium, 113
displacements:
—uterine suspension, a supplemental report, 519
UVEITIS
—about anterior choroiditis in chronic uveitis, 274
VAGINA
—effect of penicillin vaginal suppositories on morbidity in vaginal hysterectomy and on the vaginal flora, 115
VAGINAL SMEAR
—morphologic and cytochemical vaginal-smear study, effect of topical penicillin in the treatment of focal infections of the vaginal tract, 382
—vaginal smear, its value in general practice, 115
VAGOTOMY
—vagotomy and duodenal ulcer, 397
VARICELLA—*See Chickenpox*.
VASOMOTOR DRUGS
—effect of certain vasomotor drugs on the vessels of the fundus oculi, 233
VECTOCARDIOGRAPH
—universal vector cardiograph, 36
VENTRICLES
—genesis of the electrocardiogram of right ventricular hypertrophy, 341
VERTIGO
—labyrinthine vertigos, 738
VIRUSES—*See also Coxsackie Virus*.
influenza:
—influenza viral infections in Boston, September 1947 to August 1949, a study of the serologic response of patients and of the antigenic differences among the influenza viruses that were isolated, 324
VISION
—changes in vision during adolescence, 315
—effects of uniform and non-uniform surrounds on foveal vision, 308
—disturbances of vision in mental disease, 316
—Peoria visual screening project, 315
tests:
—changes in visual skills of school children following summer vacation, 741
—effect of light absorbing filters on the discernibility of television test patterns, 741
VITAMIN B_{12}
—effect of vitamin B_{12} in pernicious anemia and subacute combined degeneration of the cord, 732
VITAMIN C
—studies in vitamin C and protein metabolism in surgical patients on a routine hospital diet, 394
VITAMIN E
—vitamin E blood levels in premature and full term infants, 603
WILLAN-PLUMBE SYNDROME—*See Psoriasis*.

WIN 2747
—use of WIN 2747 in anesthesiology, 722
WOUNDS
—management of wounds, open and gunshot, 401
abdominal—See Abdomen, wounds.
XANTHOMATA
—sudden death in childhood with xanthomata, 105
XERODERMA PIGMENTOSUM
—xeroderma pigmentosum of mild type, 349

Cumulative Author Index

A
Abdallah, A., 339
Abdel-Nabi, S., 345
Abeshouse, Benjamin S., 446
Abt, Isaac A., 464
Adams, W. E., 392
Aird, R. E., 601
Allen, Edward B., 385
Allen, G. W., 444
Altemeier, William A., 393
Anderson, Camilla M., 463
Anderson, R. H., 750
Anderson, Ruth M., 431
Anderson, T. E., 349
Andreu, 450
Andrews, G. C., 736
Anspaugh, R. D., 378
Appelbaum, Emanuel, 727
Arany, L. S., 328
Arato, Stephen, 496
Armitage, H. V., 105
Arnold, William P., Jr., 728
Aronson, Natalie, 604
Artusio, Joseph F., Jr., 723
Ask-Upmark, Erik, 96
Atkinson, Wm, J., Jr., 583
Auzépy, P., 39
Ayre, J., 382
Ayre, W., 382

B
Bachrach, William H., 463
Baeckmann, C., 388
Bailey, Frederick N., 727
Baker, M. E., 519
Ballan, P., 512
Barba, William P., II, 263
Barbour, R. G. H., 266
Bargen, J. Arnold, 282
Barritt, A. Sidney, Jr., 284
Barter, Robert H., 106, 379
Bartlett, Marshall K., 436
Bateman, J. F., 100
Baum, W. C., 31
Bayliss, R., 31
Beamer, P. R., 51
Becking, A., 36
Bedson, S. P., 325
Begg, M., 349
Beidleman, B., 35
Bell, R. Edward, 582
Bengtsson, Lars Ph., 380
Benjamin, Harry, 595
Bennett, A. E., 103
Bennett, Ivan, Jr., 406
Berman, B., 714
Bernard, Etienne, 724
Berthrong, M., 406
Betourné, C., 337
Bevan-Brown, M., 753
Bing, R. J., 284, 581
Biskind, Morton S., 589
Blain, E., 742
Blickman, J. R., 585
Blinder, H., 288
Bloch, Robert G., 449
Bloom, W., 335
Bockus, Henry, 605
Boger, William P., 329, 597
Bondonny, R., 512
Bonkalo, Alexander, 454, 460
Boone, J. A., 407
Bouilloc, J., 725
Bovet, Daniel, 718
Braaf, Murray M., 390
Bradley, Stanley E., 754
Brahy, J., 233
Branwood, A. W., 398
Breckenridge, M. A., 669
Brickner, Richard, 391
Brisset, C., 502
Brobeck, J., 94
Broomes, E. L. C., 744
Brougher, John, 106
Brown, M. H., 314
Brown, Maurice, 394
Brown, Seymour, 748
Browne, Marjorie, 234
Bryce-Smith, R., 510
Bucy, P. C., 508
Bundeson, Herman, 98
Burckhardt, C., 40
Burger, H., 36
Burstein, H., 288

C
Cadenhead, Ernest F., 521
Calazel, P., 284, 581
Calhoun, John B., 235
Camp, J. D., 433
Campbell, H., 732
Campbell, Meredith, 170
Cannon, A. Benson, 736
Caprio, Frank S., 56
Carithers, Hugh A., 319
Caro, M. R., 736
Carp, Louis, 392
Carpenter, C. R., 235
Cartwright, G., 89
Cassady, J. V., 309
Castets, P-H., 512
Castillo, Julio C., 715
Castronuovo, John J., 43
Cathala, P., 39
Caulfield, Philip A., 438
Cazaban, R., 508
Chang, M. C., 512
Chester, Saul W., 381
Chinn, H. I., 461
Chope, H. D., 578
Cline, W., 334
Clow, Hollis E., 385
Cofer, Olin S., 519
Cohen, Sheldon G., 733
Colfer, H. F., 736
Collias, N. E., 235
Collins, Donald C., 441
Console, A. Dale, 721
Cook, Edward N., 447
Cook, Robert, 659
Cooper, J. F., 290
Couzi, Jacques, 495
Cowan, Irving I., 97
Craig, W. McK., 433
Crane, A. Reynolds, 46
Crawford, J. S., 311
Criep, Leo H., 733
Croll, Leo, 270
Croll, Maurice, 270
Crosnier, R., 725, 726
Crumpler, H. R., 604
Cuche, F. T., 450
Culbertson, J., 287
Culot, Y., 447
Curley, Francis J., 228

D
Daley, R., 284, 581
Damiani, Michal, 289
Dammann, F., Jr., 284, 581
Darbon, A., 725, 726
Darling, Robert C., 724
Darner, C. B., 674
Davies, C. E., 49
Davis, M. Edward, 676
Davson, Hugh, 316
Dawood, M. M., 340
DeBeer, Edwin J., 715
Dekking, H. M., 232
Delaville, G., 726
DeLee, Joseph Bolivar, 676
Demange, G., 512
Dent, C. E., 604
Desusclade, 450
Desvignes, Pierre, 495
DiCaprio, J., 228

Dieckmann, Wm. J., 576
Dittrich, R. J., 389
Dodge, H. W., Jr., 433
Dohlman, Claes H., 380
Dolan, Patrick T., 435
Doll, Richard, 327
Donaldson, John, 55
Donovan, P., 394
Dorken, Herbert, 747
Dorn, Harold, 661
Douglas, George Capers, 516
Douglas, Gilbert F., 516
Douglas, Gilbert F., Jr., 516
Douglas, Harold S., 604
Downing, Daniel F., 407
Draper, A., 284, 581
Draper, A., Jr., 284, 581
Dray, S., 578
Dripps, Robert D., 717
Duchon, M. L., 491
Duckett, J. W., 439
Ducourneau, P., 725, 726
Dudley, H. C., 595
Duncan, Charles H., 748
Duncan, G. G., 35, 335
Dutcher, James D., 712

E

Echeverria, Rufina, 233
Eckerling, Beniamin, 401
Edelman, I., 34
Edison, A. O., 450
Edlen, Abe, 32
Edmund, Jens, 272
Egenoff, G. F., 376
Ehrenhaft, Johann L., 750
Eisenstadt, W. S., 37
El Kordy, M. I., 339
Emlen, John T., 235
Engel, Gilson C., 437
Enjalbert, 450
Epstein, Ervin, 464
Epstein, F., 288
Estes, E. Harvey, Jr., 751
Etheridge, M., 31
Etzine, S., 274
Evans, Albert L., 519
Evans, Edward J., 261

F

Fabrykant, Maximilian, 452
Falsone, Jack J., 284
Fandre, M., 39
Fanelli, Rocco, 715
Fantl, Kurt, 504
Farmer, H. S., 491
Favreau, Robert, 382
Faxon, Henry D., 431
Fazekas, Joseph F., 511
Feldman, Maurice, 386
Felsenfeld, Oscar, 727
Ferencz, C., 284, 581
Fichtelius, Karl-Erik, 727
Filer, Lloyd J., Jr., 603
Findlay, G. H., 733
Finland, Maxwell, 93, 324, 403
Fletcher, A. P., 338
Flurin, R., 39
Foldes, Francis F., 722
Foley, Walter E., 577
Foote, F. M., 742
Ford, Clellan, 663
Forgács, Joseph, 232
Foster, J., 284, 581
Foster, Merritt W., Jr., 385
Fowler, Edmund P., 230, 739
Fowler, N. D., 343
Fox, Meyer S., 737
Frandsen, Emil, 271
Frantzell, Arne, 725
Friedman, Maurice H., 591
Fritel, D., 337
Fry, E., 94
Fry, Glenn A., 308
Fuller, J. L., 235
Funkhouser, James B., 316

G

Gabraoui, B., 323, 345
Gachkell, V., 502
Gale, J. W., 749
Gallagher, J. Roswell, 315
Gallagher, Martin E., 329
Garber, E. C., Jr., 515
Garnepy, Louis J., 116
Garvin, John, 345
Gavey, C. J., 326
Gayle, R. Finley, Jr., 385
Geddes, J., 397
Geller, William, 217
Gerard, R., 284, 581
Gersh, E., 288
Gershberg, H., 94
Gillam, J. B., 674
Gilmore, John, 605
Gilmour, D., 507
Glass, Morris, 113
Gordon, B., 407, 579
Gordon, G. S., 601
Goss, Leonard J., 235
Govaerts, J., 432
Graber, T. M., 219, 320
Graham, Robert, 741
Grant, Robert P., 751
Graveson, G. S., 276
Greenberg, Harold A., 234
Greenberg, Sarah K., 605
Greenspan, R., 404
Griffith, Harold, 720
Groen, J., 585
Gros, 508
Gross, P., 736
Grossman, M. I., 463
Gubler, C. J., 89
Gulo, M. J., 173
Gunn, J. A., 115
Gutch, C. F., 339
Guth, S. K., 267
Guthrie, Donald, 105
Guttmacher, Alan F., 666
Guzman, Ricardo, 233

H

Hagopian, Peter, 99
Haines, Howard F., 269
Hall, A. Fletcher, 350
Hall, George, 292
Hall, H. E., 319
Hall, R. M., 267
Halowani, A., 339, 340
Hamburger,, Morton, 449
Hamourger, W. W., 499
Hamlin, Edward, Jr., 436
Hanlon, John J., 607
Hannon, J. T., 450
Hansen, A. S., 444
Harlin, Harrison C., 443
Harper, Ian S. H., 434
Harris, C. M., 334
Harris, H., 604
Harris, I. D., 498
Haslam, N., 334
Hatz, F., 40
Hauch, P., 397
Hauenstein, V. D., 343
Hawkins, R. R., 605
Hawkins, Robert J., 377
Hayes, E. R., 34
Heckel, Norris J., 752
Heimbecker, R., 284, 581
Heinbecker, Peter, 433
Helper, H. N., 586
Henderson, John W., 313
Hendrick, J. W., 751
Henry, J., 602
Herma, Hans, 606
Herrell, Wallace E., 337
Herrmann, George R., 455
Herrmann, Pierre, 496
Herrold, Russell D., 321
Herschberg, A. D., 391
Herzon, H., 448
Hilden, Tage, 458
Hill, A. Bradford, 327
Hirsch, M. J., 233
Hirsch, S., 283
Hock, Ernest F., 48
Hodes, Horace L., 265
Hodgson, Jane E., 377
Hoffman, Murray S., 337
Hoffman, R. R., 594
Hofstetter, H. W., 314, 741
Holdsworth, W. G., 750
Hollander, D., 97
Hollenhorst, Robert W., 313
Holley, H. L., 592
Holliday, Pope B., Jr., 265
Holm, Eijler, 307
Hood, J. R., 396
Hopkins, J. G., 736
Hoppe, James O., 716
Horoschak, Steven, 404
Horowitz, W., 288
Howell, C. M., Jr., 736
Hoyne, A., 448
Huber, Alfred, 316
Huffman, John W., 520
Huggert, A., 274
Hull, E., 444
Humphreys, R. J., 291
Hunter, G. Wilson, 674
Hussar, A. E., 592
Hyman, A., 31

I

Ibañez, Sergio, 260
Inghar, S., 93, 403

Ingelmark, Bo E., 725
Ingraham, Norman R., Jr., 513
Irving, Laurence, 235
Isaacson, Barnett, 406
Ivy, A. C., 463

J

Jackson, Edith B., 383
Jacobsen, Erik, 459
Jankeson, I. R., 588
Jarcho, L. W., 714
Jervell, Otto, 342
Johnson, Alan J., 220, 266
Johnston, Charles L., Jr., 584
Jonas, A. D., 599
Jones, G. A., 104
Jordan, E. J., 431
Judson, W., 287
Judson, W. E., 288
Junet, Robert, 347

K

Kadison, Elmer R., 727
Kamminga, Chr. E., 585
Kapel, O., 400
Kaplan, Eugene, 317, 318
Karlberg, P., 38
Karpinski, Felix E., Jr., 319
Kass, E. H., 403
Katila, O., 462
Kay, Frank A., 388
Kearns, Walter, 170
Keiffer, R., Jr., 581
Keil, Philip G., 438
Keith, Haddow, 38
Kelemen, G., 518
Kelly, H., 31
Kendig, Edwin L., Jr., 261
Kent, Grace H., 606
Kepecs, J. G., 503
Kephart, Newell C., 741
Kessler, Althea, 221, 323
Keyes, E. L., 396, 431
Keys, Ancil, 34
Kieffer, R., Jr., 284
King, J. Talbott, 284, 581
Kipsner, Joseph B., 453
Kirmse, Thomas W., 222
Kirtley, James A., Jr., 399
Klatsin, Ethelyn H., 383
Klauder, Joseph V., 735
Klemes, M. A., 506
Kline, Carl L., 173
Knox, M. Lancet, 738
Kobacker, J. L., 282
Korenchevsky, V., 346
Kotcher, Emil, 322
Kral, Adalbert, 747
Ku, Y. C., 269
Kuhns, W. J., 89
Kuna , S., 450
Kurth, D. M., 36
Kurth, Gertrude M., 606
Kyser, Franklin A., 175

L

Lambeth, Samuel, 114
Lancaster, W. B., 742
Lang, L. P., 407
Laporte, A., 337
Large, Alfred, 90, 511
Larmande, A., 491
Larsson, Sven, 312
Lasciewicz, A., 739
Lebensohn, James E., 308
Lecuire, J., 395
Lederer, Francis, 52
Lefevre, Ch., 745
Leggat, Peter O., 342
Leibowitz, Sidney, 587
Leikin, S., 322
Lenegre, J., 510
Lepercq, G., 39
Lepeschkin, E., 291
Lethin, Anton N., 383
Lette, A., 724
Levy, Joseph, 285
Lewin, S. A., 605
Lewis, J. M., 604
Lewis, Philip M., 278
Ley, R., 404
Lichtenstein, B. W., 509
Liebhold, R., 332
Light, G. A., 392
Lihn, Henry, 387
Lilienthal, J. L., Jr., 714
Lincoln, Edith M., 222
Lingamfelter, C. S., 734
Linsell, W. D., 338
Lisa, J. R., 171
Litter, J., 287
Livingston, Samuel, 265
Livingstone, H. M., 392
Lloyd, Frederick A., 447
Lock, Frank, 384
Loeb, Harold G., 221
Loewenberg, Richard D., 387
London, Louis S., 56
Long, C., 94
Longacre, Alfred B., 577
Lowe, C. R., 745
Lowenhaupt, E., 33
Luckiesk, Matthew, 267
Lund, C. J., 743
Luric, M. H., 518

M

MacAlpine, I., 503
Machella, T. E., 95
Macintosh, R. R., 510
MacKenna, R. M. B., 503
Macklin, Madge T., 264
MacLeod, John, 671
Macpherson, Cluny, 746
MacQueen, J. W., 388
Magidson, O., 343
Maluf, N. S. R., 229
Manas, Leo, 267
Maraist, F., 284, 581
Marcy, C. H., 577
Maronde, Robert F., 344
Marsh, David Fielding, 712
Marshall, Glenn, 432
Marshall, Homer C., 453
Martin, M., 725
Mason, Harold L., 282
Mason, Karl E., 603
Mather, James M., 728
Mathieson, Don R., 282
Matte, L., R., 260
Matteucci, Walter V., 336, 597
Maumenee, A. E., 273
Mayman, Martin, 387
Mazzoni, Henry A., 741
McCain, John R., 107
McCay, Clive M., 460
McClure, David, 348
McCombs, R. P., 290
McCullagh, E. Perry, 451, 592
McGregor, M., 341, 345
McGuire, J., 343
McIntyre, A. R., 711
McKeever, L. G., 103
McLane, Charles, 678
McLaughlin, W. F., 505, 601
McLaurin, J. W., 740
McMichael, J., 31
Meads, M., 334
Means, J. H., 312
Mears, Burtis J., 453
Menninger, Karl, 387
Merck and Co., 174
Meredith, E. Matilda, 219, 323
Meredith, H. V., 219, 317, 323
Merkel, Richard, 375
Meyer, Ovid, 36
Miale, John, 115
Mickelson, O., 34
van Milaan, J., 36
Miller, E. O., 34
Miller, J. L., 734
Millman, Milton, 460
Millmann, N., 673
Milner, L. R., 588
Mithoefer, James, 47
Modlin, Herbert C., 498, 603
Moll, Norman, 260
Mollerstrom, Jakob, 460
Monnier, 450
Moore, Robert Allan, 607
Morgan, Meredith W., 268
Morgan, Russell E., 401
Morley, B., 376
Morrison, Samuel, 386
Morton, David E., 100
Motley, H. L., 407
Motokawa, Koiti, 275
Much, Viktor, 493
Mulry, W. C., 595
Murray, Gordon, 402
Musial, Wm., 382
Mustacchi, P. O., 33

N

Nady, Andrew, 460
Naquin, H., 316
Nathanson, M. H., 332
Necheles, H., 405
Negley, J. C., 454
Nelson, C. T., 736
Nesbit, R. M., 31
Newton, William A., Jr., 39
Noojin, Ray J., 734
Norcross, John W., 730

Nord, Borje, 312
Norton, Stata, 715
Noth, Paul, 90

O

Olsen, A. Y., 54
Ombredanne, Marcel, 738
Orr, Thomas G., 578
Ousset, J., 745
Overall, James C., 399

P

Palazzoli, 726
Palmer, Harold D., 39
Palmer, Thomas H., 442
Palmer, Walter L., 398, 453
Papez, J. W., 100
Papp, Cornelio, 457
Paris, P., 510
Parker, R. T., 319
Parks, John, 106, 379
Pathman, Julian, 234
Paton, W. D. M., 714
Payne, Eugene H., 448
Pearson, Grosvenor P., 505, 601
Peck, Samuel M., 751
Pelikan, Edward W., 720
Perry, Thomas L., 322
Peterson, D. B., 104
Phillips, Arthur P., 715
Ping, R. J., 581
Pitts, Forrest W., 329
Pohlman, Max Edward, 737
Pollak, O. J., 588
Pommerenke, W. T., 669
Poncher, Henry G., 464
Ponder, Eric, 234
Popper, Hans, 261
Posey, E. Leonard, Jr., 282
Post, Joseph, 332
Potashnick, R., 733
Potter, J. A., 315
Pottinge, R. E., 376
Poulhes, J., 745
Poulsen, I. P. V., 227
Price, E. A., 733
Principato, F. R., 444
Prindle, Richard A., 228
Pritikin, R. I., 491
Probstein, J. G., 441
Prout, Curtis T., 90
Pullen, Roscoe L., 88*

Q

Quercy, 450
Quick, Armand J., 45
Quinn, Lester H., 488

R

Raab, W., 291
Rabin, A., 503
Rabinowitz, Haskell, 289
Rabinowitz, Paul, 434
Rados, Andrew, 275
Rakoff, A. E., 493, 497
Raleigh, Gordon W., 341
Randall, Lowell O., 719
Rantz, L. A., 228
Record, R. G., 745
Reeves, Robert L., 728
Reid, E., 31
Reisner, Edward H., Jr., 727
Remky, H., 314
Rheinlander, H. F., 290
Rhoads, Paul S., 321
Ricci, J. V., 171
Rich, Arnold, 406
Richards, Charles E., 451, 592
Richards, D. G. B., 730
Richmond, Julius B., 464
Ricketts, William E., 731
Ricordeau, G., 337
Ricosse, J., 725
Riess, Bernard F., 235
Riffenburgh, Ralph S., 488
Rigdon, R. H., 105
Riker, Walter F., 716, 718
Rimmerman, A. B., 594
Ripley, Herbert S., 748
Riser, Abner B., 451
Ristine, E. R., 444
Riska, Nils, 326
Rountree, Phyllis M., 266
Robertson, Charles W., 291
Robin, M., 503
Robinson, H. M., Jr., 494
Rodriquez, J., 98
Roland, Maxwell, 517
Rosemond, G. P., 583
Rosen, Samuel, 54
Rosenthal, Alexander H., 113
Rosi, Reno, 321
Ross, Arnold L., 492
Ross, C., 397
Ross, Joseph, 273
Rothnem, Morris R., 675
Ruilmann, C. J., 173
Ruiz, Amadeo N., 379
Ruskin, Arthur, 289
Russell, Brian, 42
Rysi, R., 307

S

Salmon, Albert, 510
Sammis, Florence E., 175
Sands, Irving J., 101
Sarrazin, R., 745
Schadt, T. E., 390
Schall, L. A., 518
Scheifley, Charles H., 285, 579
Schimmel, Nelson H., 597
Schneckloth, R. E., 454
Schneider, Louis, 456
Schneirla, T. C., 235
Schoch, William G., 431
Schwartz, Abraham, 351
Schwemlein, G. X., 98
Scott, J. P., 235
Scott, John W., 235
Scott, R. C., 343
Scott, Roland B., 221, 323
Scratch, N., 397
Seitchik, Joseph, 108
Selye, Hans, 606
Senn, Milton J. E., 754
Serani, Hector, 253
Shea, Ethel, 724
Shen, Shu Shu, 598
Sherman, A. Russell, 48
Simmons, Bernard, 489
Simon, A., 509
Simons, Donald, 391
Singmaster, Lawrence, 437
Sirek, Otapar V., 460
Skinner, H. Alan, 57
Slatkin, M. H., 734
Sloane, Albert E., 315
Sluder, H. M., 384
Smelin, R., 288
Smith, Anna K., 235
Smith, George, 42, 218
Smith, Homer V., 225
Smith, Judson A., 436
Smith, K. Shirley, 457
Smith, William, 268
Soifer, Albert, 598
Solomon, R., 34
Soloway, S., 34
Sones, F. Mason, Jr., 454
Sonne, Inger, 458
Spence, Harry M., 443
Spicer, Sophie, 333
Spiegel, E., 99
Spink, W., 218
Stanbury, J., 312
Standal, Brynjulv, 310
Stankovic, M., 496
Stein, Harold, 741
Stengle, James M., 341
Sterner, G., 38
Stevenson, Ian, 748
Stolte, J. B., 94
Stone, Abraham, 664
Strelinger, Alexander, 445
Street, Judd, 316
Strengers, L., 264
Stromme, William B., 675
Strongin, Edward I., 90
Stuart-Harris, C. H., 325, 326
Sugar, O., 508
Sumner, J., Jr., 104
Sun, D. C. H., 95
Susman, M. P., 330
Sutton, Helen, 234
Suzuki, Kiichiro, 346
Suzuki, Kiitiro, 275
Svien, H. J., 433
Sysi, R., 314
Szymanski, F. J., 736

T

Tagnon, H., 217
Taguchui, Reiko, 377
Tatibouet, L., 510
Taylor, D. R., 733
Taylor, N., 511
Taylor, Nelson, 90
Thélin, Francois, 41
Theodus, P. A., 407
Thom, C. H., 171
Thomas, J. Warrick, 585
Thompsen, Warren S., 657
Thompson, M., 33

* Editorial

Thompson, R. Kenneth, 582
Thompson, Robert T., 456
Tice, Galen M., 578
Tierney, Thomas M., 377
Tilkin, L., 502
Tinsley, C., 287
Titche, L. M., 460
Titus, Paul, 116
Toaff, R., 401, 744
Todd, R., 34
Toulant, M., 491
Toulant, P., 491
Town, A. E., 493, 497
Trimble, H. G., 458
Trope, R. A., 490
Tseng, H. C., 269
Tucker, W. I., 501
Tuddenham, Read D., 221
Turk, Richard, 103
Turner, Clifton S., 315
Turner, Samuel, 115
Turner, Thomas, 97
Tuttle, Esther, 590, 591
Tyson, Arthur M., 63

U

Ungley, C. C., 732
U. S. Naval Medical Research Unit No. 4, 50, 51
Unna, Klaus R., 720
Urteaga, Oscar, 448

V

Van Beuningen, E. G. A., 277
Van Rensburg, C. R. J., 733
Vermilye, H. N., 33
Vennesland, Kirsten, 449
Volini, Italo F., 727
Volk, Bruno W., 261
Vollum, R. L., 225

W

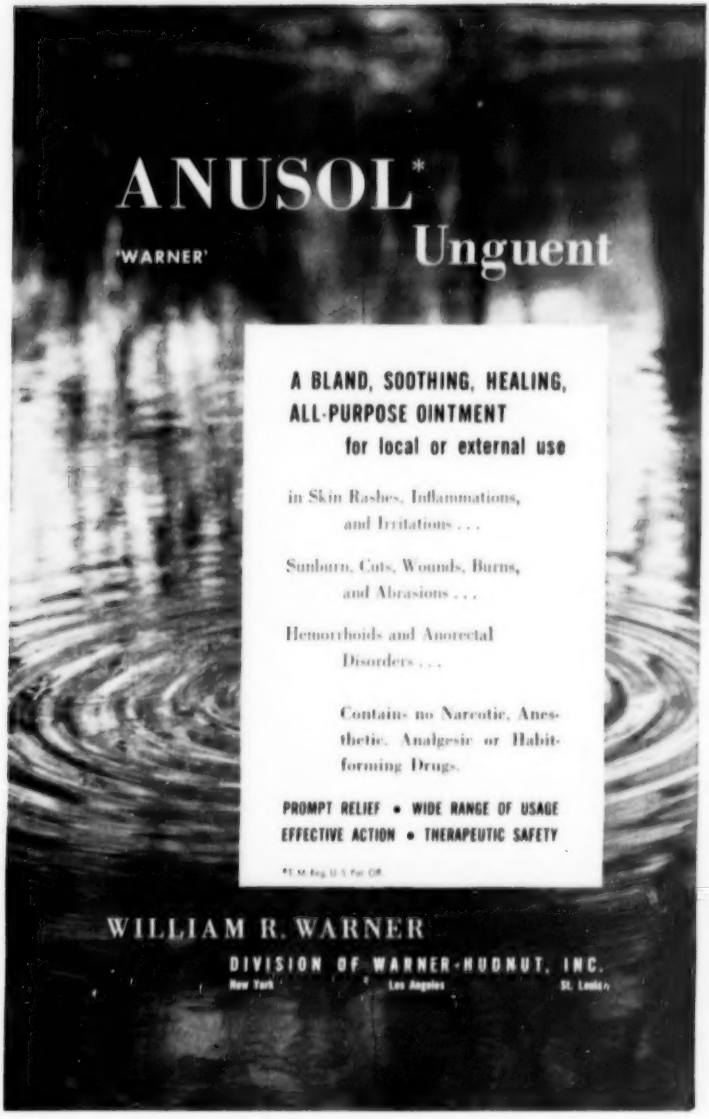
Waisbren, B. A., 218
Waldo, John F., 582
Walker, Jacqueline, 350
Wallace, J. Thorton, 108
Wallmark, G., 38
Walser, E., 309
Walsh, Theo. E., 51
Walters, M. B., 290
Walton, R. J., 347
Ward, G. E., 751
Warner, Homer R., 283
Warson, S., 602
Warter, Peter J., 404
Wassersug, J. D., 505, 601
Waters, Ralph M., 752
Weigand, C. G., 55, 96
Weinstein, Paul, 232
Wellman, William E., 337
Wertheimer, P., 395
Wescoe, W. C., 716, 718
Westall, R. G., 604
Westcott, R. N., 343
Westman, Axel, 384
Weymouth, F. W., 233
Wharton, Lawrence R., 170
Whipple, R., 335
White, M. Moore, 518
White, Mary Alice, 90
Whittaker, W., 343
Wilcox, R. R., 334
Wilkins, R., 287
Wilkins, R. W., 288
Willard, Harold R., 452
Willebrands, A. F., 585
Williams, Moyra, 172
Williams, R. H., 174
Wilson, M. G., 586
Wilson, M. Weatherstone, 95
Wilson, V. H., 730
Wintrobe, M. M., 89
Wirth, John, 41
Witmer, R., 490
Wnuck, A. Lloyd, 715
Wolf, Geo. A., Jr., 452
Wolgamot, John R., 335
Wood, James R., 458
Wood, Paul, 343
Wood, R., 316
Woods, Alan, 316
Woodward, T. E., 319
Wright, Claude-Starr, 596
Wright, Stanley W., 603
Wrong, Norman, 42
Wycis, H., 99

Y

Youmans, Guy P., 321

Z

Zak, Frederick, 350
Zises, Milton, 42, 218
Zoutendyk, A., 380
Zuelzer, Wolf W., 39, 317, 318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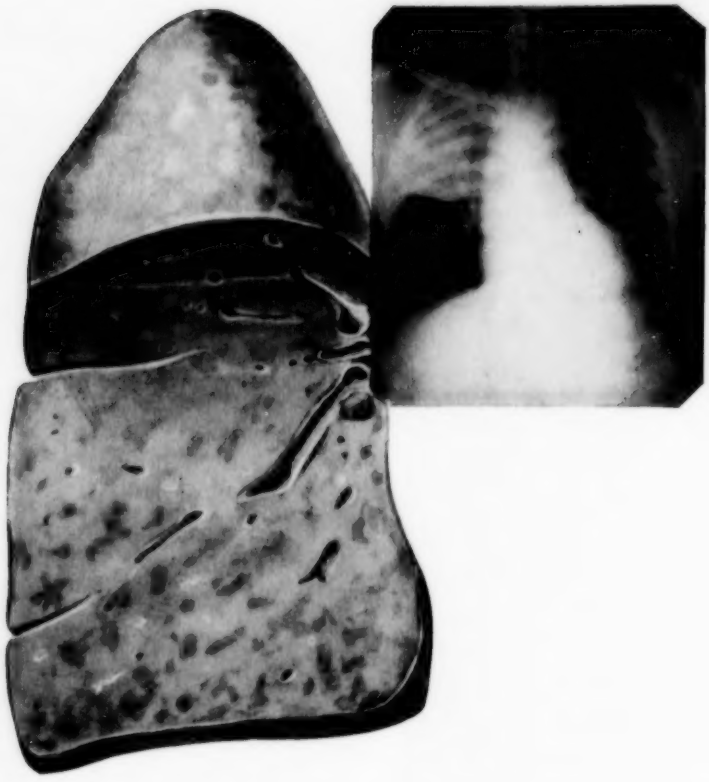

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